Engin. Library

# S·A·E Journal

JUNE 1940

THE SOCIETY OF AUTOMOTIVE ENGINEERS ·

# MODERN LIFE on the MISSISSIPPI

## CHICAGO & SOUTHERN INTRODUCES NEW DOUGLAS DC-3's WITH 1200 h.p. WRIGHT CYCLONE ENGINES

NOT so many years ago, feats of the famous river packets made folk-lore along the great Mississippi, and Mark Twain, himself a river pilot, wrote this stirring era into the country's literature. Today the basis of a new chapter in Mississippi history is being provided by the Chicago and Southern airliners which follow "The Valley Level Route" above the majestic Father of Waters.

Chicago and Southern's latest contribution to modern life on the Mississippi is a new fleet of Douglas DC-3's now in operation between Chicago and New Orleans. Powered with 1200 h.p. Wright G-200 Cyclones—the most powerful of the single-row Cyclone series—these luxury ships bring a new conception of speed and performance. Service by attractive stewardesses provides a degree of comfort unheard of in Mark Twain's day.

Chicago and Southern Airlines, long a user of Wright Whirlwinds in its fleet of Lockheed Electras, now joins the growing list of Cyclone operators who have given this engine an unapproached record in the transportation field.

WRIGHT AERONAUTICAL CORPORATION • *A Division of Curtiss-Wright Corporation* • PATERSON, NEW JERSEY

WRIGHT *Aircraft* ENGINES

# S·A·E JOURNAL

**Published Monthly By The Society of Automotive Engineers, Inc.**

Arthur Nutt, President — David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

Norman G. Shidle, Executive Editor

Vol. 46 — JUNE, 1940 — No. 6

## CONTENTS

SAE Summer Meeting Program - - - - - - - - - - - - 11

News of the Society - - - - - - - - - - - - - - - - 14

National Production Meeting - - - - - - - - - - - - - 14

**(Transactions Section Begins)**

The Automobile Headlamp Problem – *P. J. Kent* - - - - - - 229

Shortcomings of Mica Insulation for Aviation Spark Plugs – *Val Cronstedt* - - - - - - - - - - - - - - - - - - - 233

Ceramic Insulators for Spark Plugs – *Frank H. Riddle* - - - 236

Progress in Light Aircraft Engines – *C. F. Bachle* - - - - - 243

Engine Deposits – and the Effect of Some Fuel Additives – *Joseph A. Moller and Harry L. Moir* - - - - - - - - 250

Rudder Control Problems on Four-Engined Airplanes – *Clarence L. Johnson* - - - - - - - - - - - - - - - - - 262

Status of Fuel Performance Tests in Aviation Engines – *R. F. Gagg* - - - - - - - - - - - - - - - - - - - - - 271

**(Transactions Section Ends)**

Classification of Inclusions in Steel - - - - - - - - - - - 17

New Members Qualified - - - - - - - - - - - - - - - 19

Applications Received - - - - - - - - - - - - - - - - 20

About SAE Members - - - - - - - - - - - - - - - - - 21

SAE Coming Events - - - - - - - - - - - - - - - - - 28

## About Authors

• **C. F. Bachle** *(M '32) started working for Continental Motors Corp. in 1927, shortly after graduating from the University of Michigan with his B.S. degree in Mechanical Engineering. He left in 1928 to become sales engineer for Wheeler Schebler Carburetor Co., returning to Continental the following year as experimental engineer in the newly organized aircraft engine department. He has been in charge of the aircraft-engine testing laboratory since 1934, and has been active in the development of all Continental aircraft engines, including experimental models having high output. In October, 1939, he was appointed assistant chief engineer.*

• **Val Cronstedt** *(M '20) is in charge of research at Pratt & Whitney Aircraft, Division of United Aircraft Corp.*

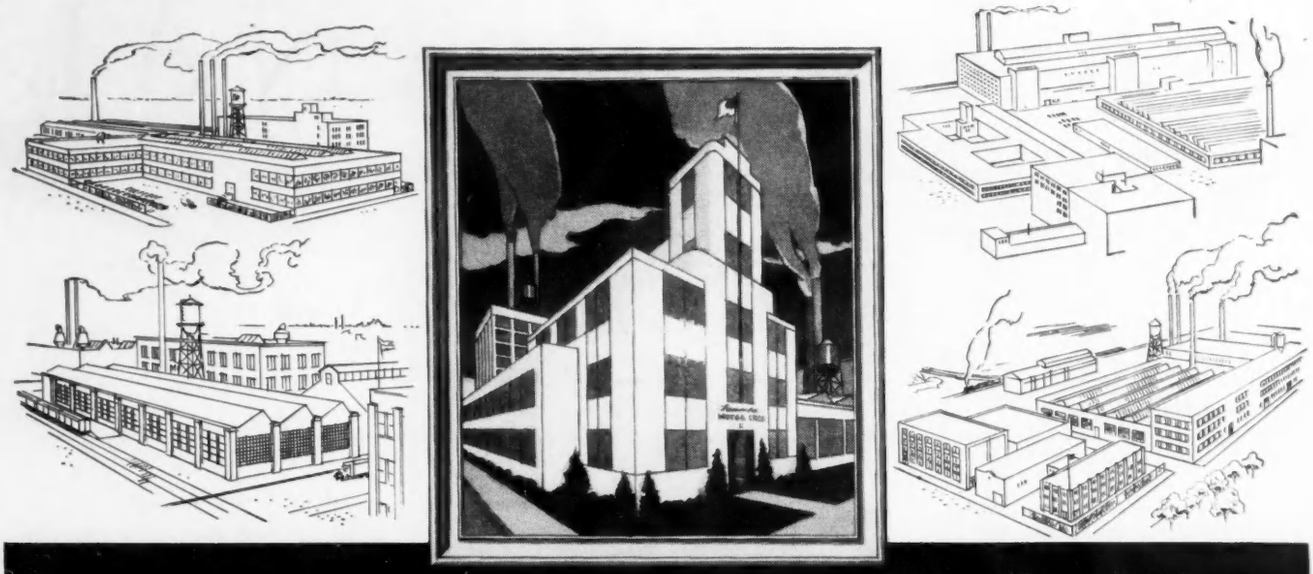
• **Clarence L. Johnson's** *work with the Lockheed Aircraft Corp. has given him wide experience in the wind tunnel, in flight testing, and in aircraft design. He joined the company in 1933, and was appointed its chief research engineer in 1937. Before joining Lockheed, Mr. Johnson was a Sheehan Fellow in Aeronautics at the University of Michigan while working for his Master's Degree, which he obtained in 1933. A year earlier he had received his B. S. in Aeronautics from the same University.*

• **P. J. Kent** *(M '20) has been secretary, vice chairman, and chairman of the SAE Detroit Section and has been active on several technical committees of the Society. He specialized in electrical engineering at Cornell University and graduated from that institution in 1914 with the degree of Mechanical Engineer. After a year with the Western Electric Co. in San Francisco, he joined the Studebaker Corp. and was placed in charge of that company's technical school. In 1917 he was appointed electrical engineer for Studebaker, and since that time has specialized in electrical equipment for automobiles, except for a period during the World War when he held posts as chief instructor of the Motor Transport Division of the Air*

(Concluded on page 33)

Publication Office, 56th and Chestnut Sts., Philadelphia, Pa.; Editorial and Advertising Departments at the headquarters of the Society, 29 West 39th St., New York, N. Y. Western Advertising Office, Room 2-136 General Motors Bldg., Detroit, Mich.

The Society is not responsible for statements or opinions advanced in papers or discussions at its meetings or in articles in the JOURNAL.



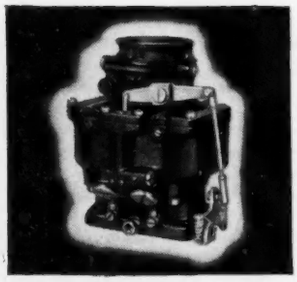
# "...serving each car manufacturer as though there were no others..."

REPEATEDLY we have stated to you, "Bendix exists because Bendix assists." The skilled personnel, the highly developed special equipment, the truly vast production facilities and the enormous amount of specialized technical experience which Bendix represents, would have to be wastefully duplicated, over and over, if Bendix were not free to serve, as it does, *all* of the automotive industry.

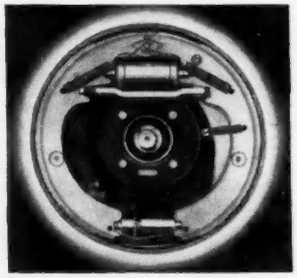
Bendix builds carburetors, brakes, gearshifts, vacuum power systems, and many another vital chassis unit. These Bendix Products, continually refined and improved, become integral parts of cars built by every manufacturer. Yet the *identity* of a Bendix Product is rarely lost . . . because it is so definitely an asset to any vehicle.

Many millions of owners know that what Bendix builds is well built. They have known it for years. Their respect for any car is the greater because of their respect for the excellent features which Bendix research has contributed to it.

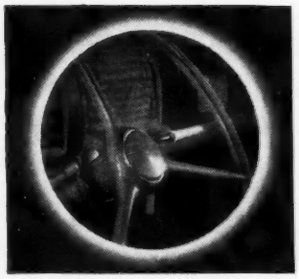
**BENDIX PRODUCTS DIVISION**
**OF BENDIX AVIATION CORPORATION**
**SOUTH BEND, INDIANA**
*In Canada:* **Bendix-Eclipse of Canada, Ltd., Windsor, Ont.**



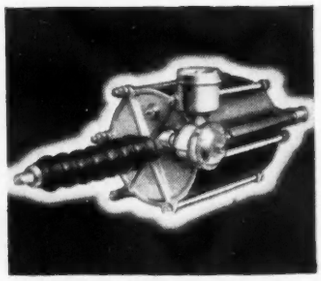
**The Stromberg Carburetor**
Pioneer of progress in carburetion—outstanding for its high efficiency, its many superiorities, its long life, its simplicity and its stability of adjustment.



**The Bendix Brake**
Smoothest, simplest, most stable in adjustment, easiest to adjust. Embodies exclusive principles which assure better braking with less pedal effort.



**The Bendix Gear Control**
Pioneer and most highly developed of steering-post gear controls—least manual effort needed—utmost responsiveness provided. Years of service.



**Bendix B-K Power Braking**
Overwhelming favorite, with every advantage of reliability, performance, long life. Only system providing everything Power Braking can offer. Millions in use.

# *Call Bendix!*

# The SAE 35TH ANNIVERSARY SUMMER MEETING

*The Greenbrier*

*White Sulphur Springs*

*West Virginia*

## JUNE · 9-14 · 1940

# The SAE

# 35TH ANNIVERSARY SUMMER MEETING

*White Sulphur Springs*
*West Virginia*
*June 9-14*

---

## SUNDAY, JUNE 9

### 35th ANNIVERSARY BANQUET

**7:00 P.M.**

***Arthur Nutt, Toastmaster***
***President, SAE***

"The Next 35 Years"
***David Beecroft***
***Bendix Aviation Corp.***

"The Sun in Motion Pictures"
***Dr. Robert R. McMath***
***McMath-Hulbert Observatory, and Motors Metal Mfg. Co.***

## MONDAY, JUNE 10

### AIRCRAFT ENGINES

**9:30 A.M.** — **N. N. Tilley, Chairman**

Altitude and the Aircraft Engine
– ***Erold F. Pierce, Wright Aeronautical Corp.***

Altitude Performance of High Output Aircraft Engines
– ***Ralph N. DuBois, Aviation Mfg. Corp., Lycoming Division***

### TRANSPORTATION & MAINTENANCE

**9:30 A.M.** — **G. W. Laurie, Chairman**

Better Fuels for Better Engines
– ***W. H. Hubner, Ethyl Gasoline Corp.***

### TRUCK, BUS & RAILCAR

**8:30 P.M.** — **B. Frank Jones, Chairman**

Increased Power per Unit Gross Weight
– ***Austin M. Wolf, Automotive Consultant***

## TUESDAY, JUNE 11

### AIRCRAFT ENGINES

**9:30 A.M.** — **Robert Insley, Chairman**

The Problem of Valve-Head and Valve-Stem Deposits
– ***A. T. Colwell, Thompson Products, Inc.***

The C. U. E. Cooperative Universal Engine Design for Aviation Engine Single-Cylinder Research
– ***A. W. Pope, Jr., Waukesha Motor Co.***

Comparison of C. U. E. Engine Installations
– ***A. L. Beall, Wright Aeronautical Corp.***

### TRANSPORTATION & MAINTENANCE

**9:30 A.M.** — **H. O. Mathews, Chairman**

Round Table Discussion of Operation Problems

### BUSINESS SESSION

**8:20 P.M.**

***President Arthur Nutt in the Chair***

### PASSENGER CAR

**8:30 P.M.** — **J. H. Hunt, Chairman**

Design Suggestions Resulting from Road Testing for Safety
– ***Dean A. Fales, Massachusetts Institute of Technology***

### *Ordnance Exhibit*

Modern ordnance equipment of the United States Army will be on display during the meeting. Made possible through the cooperation of Major-Gen. C. M. Wesson, Chief of Ordnance, the exhibit will afford an unusual opportunity to inspect examples of this country's newest fighting equipment.

## WEDNESDAY, JUNE 12

### DIESEL ENGINES

**9:30 A.M.** — **W. G. Ainsley, Chairman**

Full-Scale Engine CFR Progress Report
– **C. G. A. Rosen, Caterpillar Tractor Co.**

An Analysis of the Charging Process in the Two-Stroke Engine
– **C. F. Taylor, Massachusetts Institute of Technology**

### PASSENGER CAR

**9:30 A.M.** — **J. C. Zeder Chairman**

Engineering Properties of Rubber in Compression
– **R. W. Brown, Firestone Tire & Rubber Co.**

**9:30 P.M.**

★ **35th ANNIVERSARY** ★

**GRAND BALL**

## THURSDAY, JUNE 13

### DIESEL ENGINES

**9:30 A.M.** — **C. G. A. Rosen, Chairman**

New Applications of Aluminum in High-Speed Diesel Engines
– **Frank Jardine, Aluminum Co. of America**

Wear-Resistant Coatings
– **J. E. Jackson, Caterpillar Tractor Co.**

Load-Carrying Capacity Phenomena of Bearing Surfaces
– **Macy O. Teetor, Perfect Circle Co.**

### PASSENGER CAR BODY

**9:30 A.M.** — **John Oswald, Chairman**

Riding Comfort and Cushions
– **W. E. Lay and L. C. Fisher, University of Michigan**

Comparative Weight and Cost of Body and Frame
– **H. B. Bartlett, Parish Pressed Steel Co.**

### FUELS & LUBRICANTS

**8:30 P.M.** — **J. B. Macauley, Jr., Chairman**

Reducing Aviation-Engine Fuel Volatility
– **D. P. Barnard, Standard Oil Co. of Ind., and R. B. Cragin, M. W. Kellogg Co.**

Some Economic Aspects of Aviation Fuel Volatility
– **R. C. Alden, Phillips Petroleum Co.**

The Effectiveness of the Burning Process in Non-Knocking Engine Explosions
– **Lloyd Withrow and Walter Cornelius, Research Laboratories Division, General Motors Corp.**

## FRIDAY, JUNE 14

### FUELS & LUBRICANTS

**9:30 A.M.** — **B. E. Sibley, Chairman**

The Use of Small-Scale Single-Cylinder Engines for the Evaluation of Motor Oils
– **A. O. Willey and C. F. Prutton, Consultants, The Lubri-Zol Corp.**

Severe-Duty Engine Conditions as Related to Oil and Fuel
– **C. M. Larson, Sinclair Refining Co.**

An Instrument for the Continuous Measurement of Piston Temperatures
– **A. F. Underwood and A. A. Catlin, Research Laboratories Division, General Motors Corp.**

## COMMITTEE MEETINGS

(Tentative Schedule)

Saturday, June 8
- Corrosion. Preventives Research Subcommittee

Sunday, June 9
- CFR Aviation Fuels Vapor Lock Groups Council
- Aircraft Engine Lubricants Research Committee

Monday, June 10
- Special Committee on Membership Policy
- T B & R Activity Committee
- Ignition Research Committee
- T & M Activity Committee
- Motor Truck Rating Committee

Tuesday, June 11
- Aircraft Engine Activity Committee
- Student Committee
- Sections Committee
- Riding Comfort Research Committee
- Aircraft Engine Division, Standards Committee

Wednesday, June 12
- Lubricants Division, Standards Committee
- Membership Committee
- Highways Research Committee
- Passenger Car Activity Committee
- E P Lubricants Research Committee

Thursday, June 13
- Passenger Car Body Activity Committee
- Diesel Engine Activity Committee
- Aircraft Materials Division, Standards Committee
- Council
- General Research Committee
- T-1 Alloys Subdivision – Non-Ferrous Metals Division, Standards Committee

Friday, June 14
- F & L Activity Committee
- Meetings Committee
- Aircraft Materials Division, Standards Committee

# News of the Society

E. R. Smith, SAE vice-president for the Production Activity

## Design for Living Portrayed at National Production Meeting

"A GOVERNMENT-GUARANTEED basic subsistence to every individual in the United States throughout his whole life," is one of the startling features of "Design for Living in America," unfolded by R. E. Flanders, president, Jones & Lamson Machine Co., in a banquet speech that highlighted the two-day SAE National Production Meeting, held at the Hotel Bond, Hartford, Conn., May 7 and 8.

Focusing attention on a diagram which he sketched on the blackboard, Mr. Flanders fired the imagination of engineers and shop men alike for more than an hour as he expounded his plan. He explained that, if a man cannot find work, the Government would find him a job. If the man is unwilling but able to work, the delinquent is put "under observation" and his family supported by the Government.

"The plan is based definitely on capitalism," he emphasized. "This selection of one system, and the arousing of a determination to work under it is no light matter. Much of the confusion, waste, and tragedy of the last seven years has been due to rendering lip-service to capitalism while installing continuously one after another of the elements of state socialism.

"The prime requirement of this design," he declared, "is the ability to produce a surplus large enough to be taxed to support Governmental activity on a large scale. There is no way to support this design," he explained, "save from the productive activities of our citizens during their productive years. If that productivity is not great enough, these things simply cannot be done!"

In a short talk preceding Mr. Flanders' speech, SAE President Arthur Nutt stressed the advantages of increased SAE membership and standardization activity, urging that every member get one new member this year. He suggested that the automobile and other industries might work out standard material specifications to aid buyers, as has just been done by the aircraft industry. W. F. Teigeler, chairman of the SAE New England Section opened the banquet by welcoming the meeting to Hartford and introduced the Toastmaster, SAE Vice President for the Production Activity, E. R. Smith.

Displaying a "good neighbor" policy, many nearby sections sent delegations to the meeting, a sizable one from the New England Section being headed by its chairman, M. A. Taylor.

### New Machine Tool Plant Visited

Two bus loads of members and guests visited the new plant of the Pratt & Whitney Division of Niles-Bement-Pond Co., on the first afternoon. There they inspected, fingered, and operated various machine tools and production equipment.

The three technical sessions bristled with practical ideas and methods immediately usable by shop men. The production methods and expansion revealed in the Aircraft Production Session went a long way toward explaining why aircraft engines are no longer the "bottleneck" of American aircraft production. In a session on New Machine Finishes the results of cooperative work correlating cutting oils, machining operations, and materials promised aid to production men in small machine shops. In another paper at this session the difference between surface quality and surface finish was drawn sharply. A new method of grading fine abrasives was held up for the abrasive and finishing-equipment manufacturers to shoot at, and shop men argued various ways to control surface finish, in the final session on Abrasives.

### Cutting Fluids to Suit the Job

"For best tool life, cutting fluids should be applied in large quantities at high velocities and low temperatures . . . sulphurized oils have a tendency to stain certain non-ferrous metals, such as copper and its alloys . . . mineral lard and sulphurized oil mixtures of low sulphur percentage are interchangeable," are a few of the thirteen recommendations made in "A New Study of Cutting-Fluid Recommendations," by H. L. Moir, The Pure Oil Co., and Prof. O. W. Boston, University of Michigan, Mr. Moir's reading of this paper followed immediately after Joseph Geschelin, chairman of the first session on New Machine Finishes, opened the meeting.

Mr. Moir explained that their paper is essentially a report of the Subcommittee on Cutting Fluids of the Handbook Committee on Machinability of Steel, American Society for Metals. He told how this Subdivision started as an independent committee in 1937 for the purpose of helping machine shops that are too small to maintain specialists, by providing information on cutting fluids, couched in simple terms.

Development of a machinability rating chart was one of the first jobs of the Subcommittee, Mr. Moir reported. He pointed out that, in this chart, metals are grouped into six machinability classes, with SAE 1112 cold-drawn steel at a cutting speed of 180 fpm taken as the standard, or 100%, adding that four classes of ferrous metals and two classes of non-ferrous metals comprise the classification.

At the same time, Mr. Moir continued, a questionnaire was sent to about 500 manufacturers and machine-shop operators which listed the common cutting operations and provided blank spaces to be filled in with the cutting fluid used.

Mr. Moir then explained a chart that tabulated the cutting fluids recommended for 11 operations for each of the 6 classes defined in the machinability rating chart. He pointed out that the chart was compiled from the machinability rating chart and questionnaire.

Answering a question from the floor, Mr. Moir reported interesting experience with carbon tetrachloride and hexachloride cutting fluids. He told of one case where diesel engine bolts were pulling out because of failure of the threads. A new machining set-up was employed to cut the threads using pure carbon tetrachloride as a cutting fluid. "It worked like a charm," Mr. Moir revealed, "but the machine operators got sick from the fumes and wouldn't stay on the job." He announced that, for this reason, these chloride fluids had been prohibited by the authorities in some sections. He went on to explain that any of these chloride additions renders the cutting compounds very unstable – that they often "sublime out" at room temperature. As to their effect, he opined that, in general, they were desirable – in some applications very desirable and, in others, they make little difference.

SAE President Arthur Nutt stressed membership increase at the Production Banquet

R. E. Flanders, president, Jones and Lamson Machine Co., delivered the principal banquet speech

### Surface Quality Emphasized

The growing recognition of the value of machined surface finish in quality improvement of manufactured products was stressed by Lawrence S. Martz, Micromatic Hone Corp., who presented the second paper: "Producing Specified Finishes by Honing." A balance between surface quality and surface finish always has been required to operate machines, he pointed out, bringing out the inseparable relationship between these two factors. He averred that this balance has not always been provided in production, citing as an example the ground cylinder bores of early automobile production where slow-speed breaking-in operations were necessary for the first 1500 miles to remove the roughness from the machined surface. He pointed out that the customer then had to assume responsibility for a large part of the final processing. "In those 2500-rpm days," he recalled, "the term 'surface finish' was used predominantly in speaking of the paint job!"

Pointing out that all development work in machine finishing methods is based on the premise that planar smoothness of a boundary limit of material will provide almost complete wear resistance, he contended that this premise becomes subject to qualification in the light of expanding knowledge. Quoting from the reported findings of many investigators for confirmation, he maintained that evaluation of surface finish cannot be isolated from other major functional values of surface quality. This interrelationship, he explained, makes evident that surface quality starts in the foundry and that the quality of the surface finish depends upon the amount of control used in combined machining process.

Mr. Martz went on to discuss the portable Profilometer and Brush Surface Analyzer with the aid of slides. He revealed that extremely smooth surface finishes, ranging from 0.10 micro-in. to 10 micro-in., are being produced currently by one metal-working method – rolling – and several abrading methods comprising grinding, lapping, Superfinishing, and honing. He then analyzed the action in each of these processes. Recent developments in honing, such as the variable-pressure control sequence, the "Hydrohoner" spindle sequence, and the "Drawfinish" sequence were shown in action by means of motion pictures.

Surface profiles that are characteristic of various finishing operations were displayed on the screen by Dr. E. J. Abbott, Physicists Research Co., the first to discuss Mr. Martz' paper. He explained that he had obtained the profiles by means of a "profile recorder" which measures in true inch dimensions and gives a photographic record of the movement of a diamond-pointed stylus as it moves across the surface. He added that he took measurements across the principal grit marks. Pointing to surface profiles that showed large waves on which were superimposed smaller irregularities, he contended that some methods of checking surface irregularities do not take in enough surface width to include the waves and, therefore, do not give a true indication of surface finish. He explained how the profile recorder is calibrated by running it over a step of known magnitude. As a measure of the surface roughness, he reported that the average departure of the "wiggles" from the centerline is used, adding that this value can be measured rapidly by means of an instrument.

A compromise method of obtaining surface profiles was suggested by the next discusser, C. K. Gravely, Brush Development Co. He contended that it will produce a profile record of surface irregularities within a few seconds, and will indicate waviness resulting from diamond dressing of a grinding wheel. Ease of operation, he pointed out, will depend upon how much of the surface it is desired to measure. He concluded that this method will give a true indication of roughness and some indication of waviness.

### "Line" Production Unsuitable

Even though they turn out vast quantities calculated in terms of engine horsepower, "line" production methods are not suited to American aircraft-engine plants, averred Val Cronstedt of Pratt & Whitney Aircraft, speaking at the Aircraft Production Session. Entitled "Special Problems in the Production of Aircraft Engines," his paper dealt specifically with production methods, equipment, and layout at Pratt & Whitney Aircraft. H. W. Dunbar served as session chairman.

Mr. Cronstedt went on to amass cogent reasons for the job-lot character of aircraft engine production. "Private, commercial, and military requirements," he disclosed, "demand a large spread in the horsepower per unit engine . . . Pratt & Whitney produces three basic models of single-row radial engines and four basic models of double-row engines, ranging from 400 to 1850 hp . . . limitations imposed by propeller tip speeds demand a wide spread of propeller shaft speeds and, consequently, several different ratios are required in reduction units . . . the demand for performance at altitude creates a large number of supercharger designs . . . thus the production combinations going through the manufacturing departments become innumerable and the production problems multiply greatly."

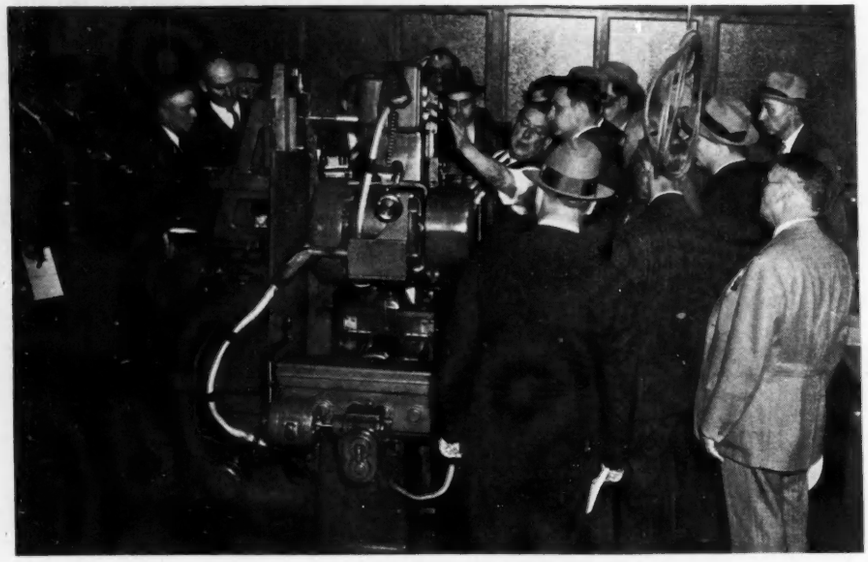
Furthermore, he continued, accelerated development has created the problem of a "continuously changing product." To illustrate this point he reported that one basic engine model in quantity production at the Pratt & Whitney Aircraft plant during 1939 had 750 engineering changes applied to it for a total of 1900 engines produced. He reported that 80 of these changes were so far-reaching that they demanded considerable proof testing before being adopted in production. To emphasize further the continual flux existing in aircraft-engine production, he asserted that one-third of the active parts are changed each year.

Speaking of equipment, Mr. Cronstedt pointed out with the help of slides that, because of the radial arrangement of cylinders of aircraft engines, machine-tool requirements are quite different than those of the automobile industry, and that the extreme flexibility required makes single-purpose machines rare, with a preponderance of standard equipment readily adapted for specific work.

Turning to materials he brought out that steel forgings are used in most industries to reduce machining time, cost, and raw material weight but the aircraft-engine industry employs steel forgings for an entirely different reason – to increase strength and endurance, regardless of the amount of material to be removed.

Discussing the rapid growth of the industry, Mr. Cronstedt announced that there had been a three-fold growth in the number of employees at Pratt & Whitney in less than a year. In the remainder of his discussion he described the layout, material flow, processes, and equipment of his company's plant.

Three questions were put to Mr. Cronstedt by Joseph Geschelin, Chilton Co., to start the discussion. He first asked whether carbide tooling was used in any other operations than the precision boring mentioned. Noting that certain parts required heating for assembly operations, he requested information on the heating means and whether induction heating had been considered for this purpose. Finally, he wanted to know the type of cutting fluids that were used in machining magnesium. He explained that the answer to his last question would be a valuable addition to the recommendations for cutting fluids contained in the paper by Messrs. Moir and Boston presented at the previous session.



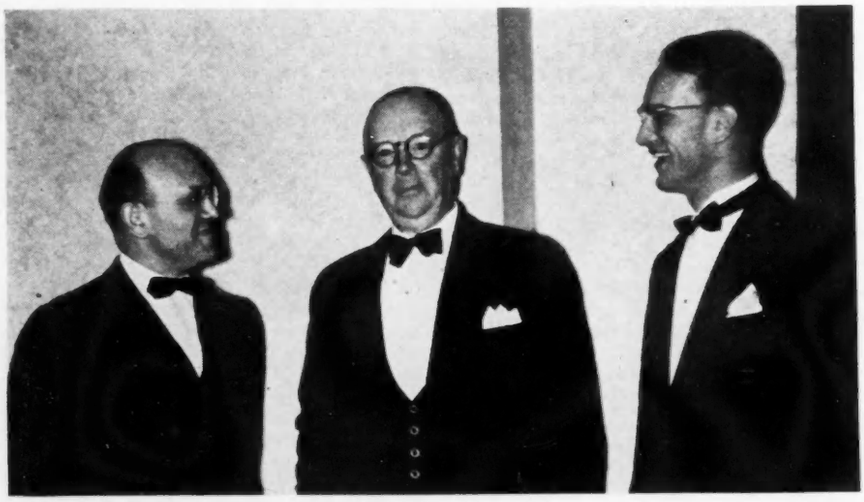
**One of many interested groups watching a demonstration of a Keller automatic toolroom machine during the inspection trip through the new plant of Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn.**
(Photograph courtesy of Pratt & Whitney)

Carbide tooling is used for many roughing and finishing operations in addition to precision boring, but induction heating is not employed to prepare certain parts for assembly at present, but is under consideration, were Mr. Cronstedt's replies to the first two questions. He added that in certain assemblies not only must some parts be heated but other parts must be cooled. He explained that dry ice was used to cool the parts and that, if desired, the dry ice could be dropped 50 F by adding acid. He referred the third question to H. J. Fischbeck, also of Pratt and Whitney.

"When we tried to machine magnesium dry, not only was the fire hazard considerable, but the heat caused distortion," Mr. Fischbeck reported. "Then we tried a cutting fluid of straight seal oil," he continued, "but found that it formed considerable mist. We finally eliminated this difficulty by adding 5% of fat to the seal-oil cutting fluid." He added that keeping the chips from piling up in the machines is a further protection against fires, and recommended that powdered asbestos is better to extinguish magnesium fires than is sand which abrades the machine bearings. Supplementing Mr. Cronstedt's remarks on tool materials, he brought out that Carboloy tools stood up better in work on the piston pin than high-speed steels, but that diamond tools are used for very accurate production. Carboloy also is used for piston-ring grooves, but that an 8% cobalt high-speed tool is employed for the fins on the inside of the piston where tolerances are not held so close.

Agreement of another large aircraft-engine manufacturer was voiced by R. F. Gagg, Wright Aeronautical Corp., who opined that Mr. Cronstedt had put the proper emphasis on the job-lot character of aircraft-engine manufacture. He stressed the difficulties of stocking parts for obsolescent engines, reporting that his company was still manufacturing parts for engines manufactured in 1925. The improved attitude of aircraft-engine manufacturers toward ease of production and lower cost is a significant point that Mr. Cronstedt did not mention, he pointed out, explaining that formerly the entire emphasis was on performance. Contrasting the plant layout of Pratt & Whitney Aircraft with that of his own company, he pointed out that each has advantages over the other, and that an important advantage of the Pratt & Whitney layout is flexibility.

## Contributors to Production Program



**Joseph Geschelin, SAE Meetings Committee representative of the Production Activity (left); Clayton R. Burt, president, Pratt & Whitney, Division of Niles-Bement-Pond Co., who served as host for the inspection trip (center); and Warren F. Teigeler, chairman of the Southern New England Section**

### New Grading Method Dissected

"A Method of Testing and Grading Fine Abrasives," was introduced by E. L. Hemingway, Foster Machine Co., in the first paper presented at the final Abrasives Session. In the absence of SAE Vice President E. R. Smith, who was called suddenly out of town, H. W. Dunbar was drafted to act again as session chairman.

The difficulty of selecting the proper abrasives or "stones" for Superfinishing machines made by his company because of the "apparent inability of stone manufacturers to grade the hardness of the bond properly and uniformly" led to the development described, Mr. Hemingway explained.

Reciting the difficulties encountered in Superfinishing operations due to lack of correct bond grading he declared that, when a stone of too great hardness is applied to a ground surface, its too-rigidly-held grits are not removed to dress and sharpen its face and the cutting action slows down much sooner than desired. When the stone used has too little bond strength, he continued, its action on the hill peaks results in an extremely rapid removal of metal as the stone breaks down very fast.

After describing various preliminary tests he reported that the use of the Rockwell hardness tester with a ⅛-in. steel ball and a 60-kg load finally was selected for grading Superfinishing stones. He displayed a curve that indicated the proper stone to use in Superfinishing a given hardness of steel under standard conditions. He explained that such graphs have been used for five months with satisfactory results, and reported that the former difficulties have practically disappeared. In conclusion Mr. Hemingway contended that every user of fine-grit bonded abrasive, no matter what their application may be, has at his disposal in this method an accurate means of predetermining their cutting characteristics.

In three prepared discussions the grading method described was subjected to searching analysis in which claimed advantages were confirmed and alleged limitations were pointed out with equal candor.

"Hardness is only one of the necessary characteristics in grading abrasive bonds," believes J. E. Kline, Micromatic Hone Corp., the first to present his prepared discussion. He concluded that the calibration of bonded abrasives, to determine their relative cutting efficiencies, must take into account: 1. the size and type of grain, the kind and structure of bond, and the method of manufacture; 2. the metallurgical characteristics and surface condition of the work piece; and 3. the magnitude and relation between the operating speeds and pressures, and the type of lubricant used. A variation of any factor in one of these groups, he explained, imposes the need for a compensating regulation of one or more of the other factors.

Dr. Lowell H. Milligan, Norton Co., expatiated on the structure of bonded abrasives to illustrate the limitations of the method. He pointed out that a vitrified-bonded Superfinishing stick is very porous and may contain half of its volume in the form of interconnecting pore spaces, whereas organic-bonded abrasives are essentially non-porous when bonded with such material as shellac or rubber compositions. He contended that the grinding action of these two types of abrasives is quite different since,

(*Continued on page 24*)

# Classification of Inclusions in Steel

**THIS proposed method for rating steel for cleanliness or inclusions is the result of work initiated at the Dec. 7, 1937, meeting of the Iron and Steel Division of the SAE Standards Committee where the desirability was emphasized of setting up one standard method for use in conjunction with SAE steels where this degree of refinement in inspection is desired by the steel users. The standard method is intended to replace the several methods then and now in use. At this meeting a Subdivision on Inclusion Charts was appointed to carry on the work by experimentation and direct comparison of methods now in use. The report of this Subdivision was approved by the Iron and Steel Division at its meeting on Feb. 6, 1940, with the recommendation that it be published in the SAE Journal as a proposed "recommended practice" before it is submitted to the SAE General Standards Committee for final adoption.**

**The purpose of publishing this proposed method is to make it available to all steel users and steel makers and to solicit their comments and suggestions to insure general acceptance of the recommendation for adoption and general use.**

**All comments, suggestions, or information bearing on this proposal should be addressed directly to F. P. Gilligan, chairman, Iron and Steel Division, SAE Standards Committee, The Henry Souther Engineering Co., Hartford, Conn., or to L. A. Danse, chairman, Subdivision on Inclusion Charts, Cadillac Motor Car Division, General Motors Corp., Detroit, Mich. To insure proper consideration it is requested that they be sent before July 1, 1940.**

NUMEROUS methods have been proposed for rating cleanliness of steel, but lack of standardization, or even correlation, has caused misunderstandings. In order to promote better understanding of cleanliness, this method is proposed for use as an SAE recommended practice.

This proposed method is intended to cover alloy and carbon steel bars, billets, and slabs up to 10 in. wide by 5 in. thick, also special sections, with the exception of sulphur-bearing types and all other free machining steels. However, from the nature of this method, it could include all steel products.

The selection and preparation of samples has not been specifically covered, but has been suggested, as follows:

Where possible, the surface to be examined is ½ x 1 in., or ½ sq in. area.

When the cross-section of the sample to be classified is sufficiently large to permit (such as a 5 x 5-in. billet), the micro specimen is cut so that the face to be polished is in a center plane of the sample, and is divided into two equal parts by a midway plane. A further requirement is that the ½ in. dimension be parallel to the longitudinal axis of the sample, that is, the direction of rolling.

When the sample to be classified is not of sufficient cross-section to permit the above method, for example, a 2-in. diameter round bar, the specimen is cut so that again the ½-in. dimension is in the direction of rolling and the 1-in. dimension is a radius of a cross-section of the bar.

It is often desirable to facilitate polishing by hardening the specimen, quenching from above the AC-3 range into the proper medium.

Polishing may be done by any desired technique. One generally followed is:

Step No. 1 – Grinding.

Step No. 2 – Rough polish – going successively from No. 0, No. 00, to No. 000 emery paper.

Step No. 3 – Fine polish – employing some medium such as jeweler's rouge or levigated alumina.

Step No. 4 – Washing – hot water followed by rinsing in alcohol.

In the last polishing operation (Step No. 3), the direction of polish should be at right angles to the direction of rolling,

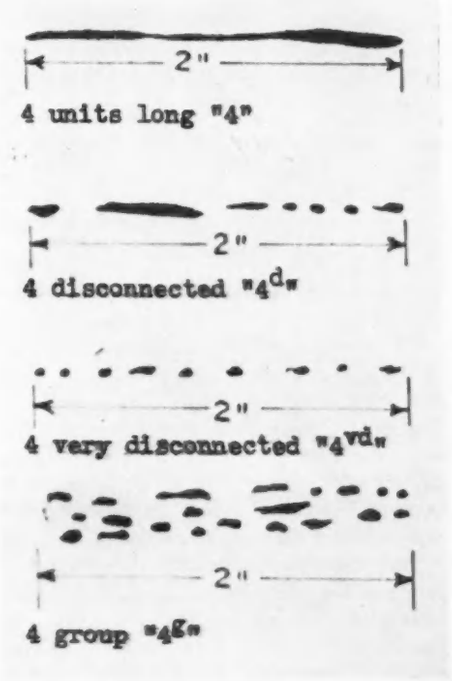
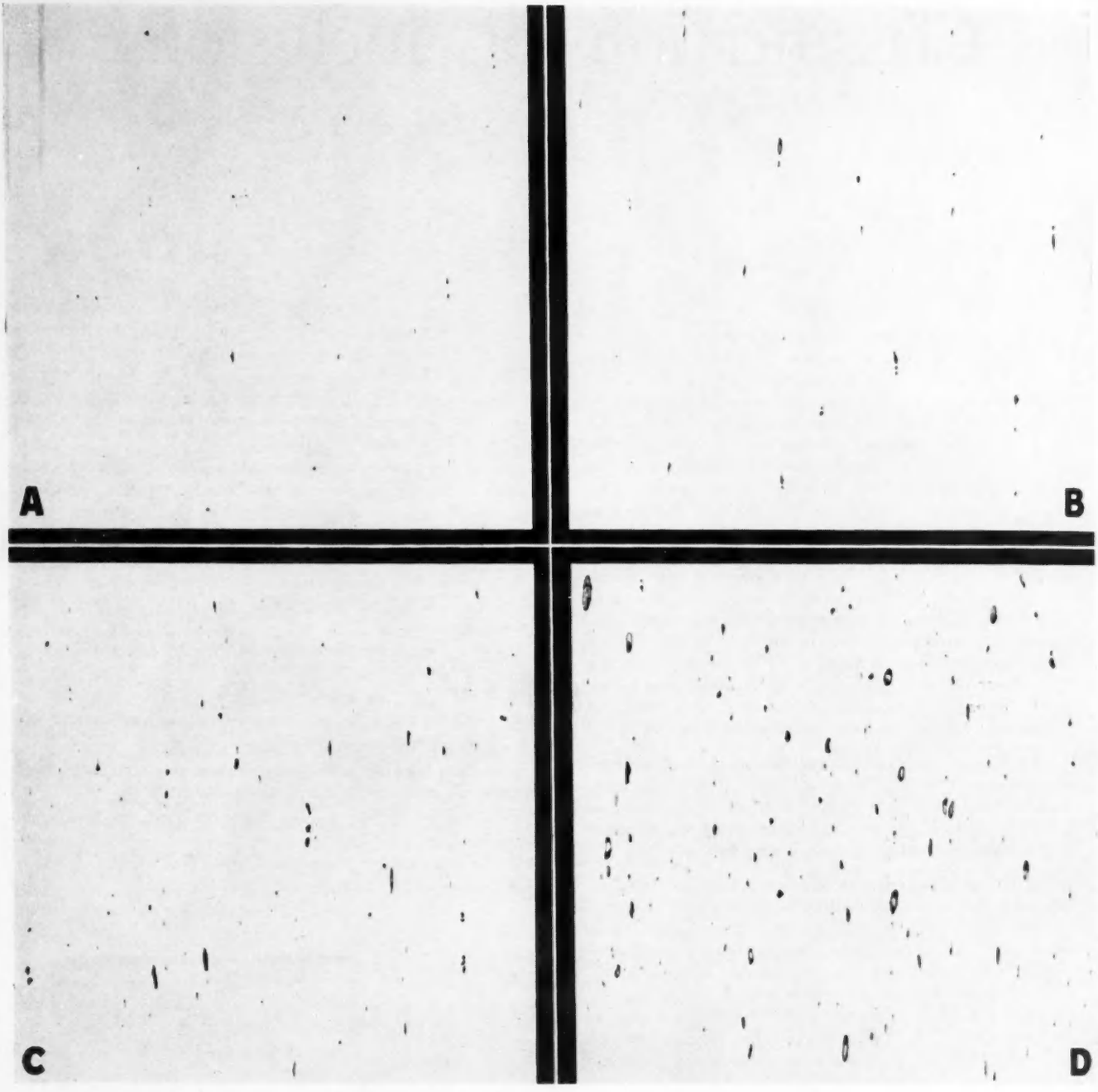



Fig. 1 – Designation of length and weight of inclusions

**The original photographs taken at 100X have been reduced to half size in these illustrations**




**Figs. 2, 3, 4 and 5 – Background classifications – A, B, C, D, respectively**

since polishing scratches in the direction of rolling tend to confuse the appearance of the specimen.

The properly polished specimen is placed on the stage of a microscope and each individual field of the entire polished area is projected successively on a ground glass screen at 100 diameters. The ground glass is ruled with a series of parallel lines which are ½ in. apart. The distance between any two parallel lines, namely ½ in. (equivalent to 0.005 in. on the specimen) is called a unit, in terms of which the lengths of inclusions are measured.

From the observations on the ground glass the following three classifications are made in the sequence given:

Longest Inclusion – 1. *The length of the longest inclusion present is represented by a number which corresponds to the number of units that the inclusion covers on the screen.* Fractional units are not used, the nearest whole unit is recorded. The width of the longest inclusion may be indicated by a suffix. This is best illustrated by the following example:

Assume that the longest inclusion in each of two specimens is 6 units in length. The difference in thickness may be denoted as $6^T$, $6^H$; other characteristics are designated by $6^d$, $6^{vd}$, and $6^g$ where

$^T$ means thin (1 mm or less in width).
$^H$ means heavy (3 mm or over in width).
$^d$ means disconnected (see examples, Fig. 1).
$^{vd}$ means very disconnected (see Fig. 1).
$^g$ means group (see Fig. 1).

A discontinuity of not less than one unit along the length of an inclusion being rated arbitrarily divides the inclusion into two inclusions, the largest of which, if it is the longest in

the specimen, is rated as above, the smaller is included in the average inclusion as follows:

Average Inclusion – 2. *The average length of all inclusions other than the longest and over one unit in length.* This is also designated by a number equivalent to the number of units covered by the average length inclusion with a suffix indicating the number of inclusions rated in arriving at the average.

For example, and to continue the illustration above, the specimen rated as $6^7$ may have in addition 2 inclusions of 4 units length, 1 of 3 units length, and 1 of 1 unit length; its average rating would then be $(2 \times 4 + 3 + 1)$, or $12 \div 4$, or $3^4$, and the full rating thus far would be $6^7 - 3^4$.

Background – 3. *Background rating designated by a letter and including all inclusions less than 1 unit in length.* For example, the longest and the average length of inclusions in four specimens may be 6 and $1^3$ respectively, but the background may be different. The ratings for these four specimens may be $6 - 1^3 - A$; $6 - 1^3 - B$; $6 - 1^3 - C$; $6 - 1^3 - D$; where the letters, *A, B, C,* and *D* refer to the classification of background as depicted in the accompanying illustrations (Figs. 2, 3, 4, and 5).

There is little difference of opinion between several observers as to the length of the longest and the average inclusions. There may be some difference of opinion regarding the background. Accordingly, it is necessary that designations of background quality be on a common basis, for which purpose the accompanying standard pictures are provided. If more exacting classification of background is desired, it can be made by using plus or minus signs after the background letter.

It is apparent then that the general form of rating will be, say $7 - 2^3 - B$; meaning that the largest inclusion in the specimen is of 7 units length, that all other inclusions are three in number with an average length of 2 units, and that the background of the specimen may be represented by photograph *B* (Fig. 3). It should be apparent also that the least rating the method will allow will be $0 - 0 - A$.

# New Members Qualified

**These applicants who have qualified for admission to the Society have been welcomed into membership between April 15, 1940, and May 15, 1940.**

**The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.**

### Chicago Section

RAIDL, FRANK (A) owner, Auto Clutch & Parts Service, Chicago (mail) 3125 Fullerton Ave.

WAGAR, T. E. (M) electrical engineer, Studebaker Corp., Franklin & Sample Sts., South Bend, Ind.

### Cleveland Section

AUFMUTH, RAY B. (J) experimental engineer, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland (mail) 12431 Osceola Ave.

FULLER, ERNEST W. (M) chief engineer, aeronautical division, Acrotorque Co., 4815 Lexington Ave., Cleveland.

### Detroit Section

ARNOLD, LLOYD E. (A) district manager, P. R. Mallory & Co., Inc., 2449 E. Grand Blvd., Detroit (mail) 327 Moran Rd., Grosse Pointe Farms, Mich.

CHAMBERS, JOHN M. (M) chief engineer, Ferguson-Sherman Mfg. Corp., Dearborn, Mich

FLAHERTY, JOSEPH F. (A) sales representative, Johnson Bronze Co., New Castle, Pa. (mail) 12-252 General Motors Bldg., Detroit.

HAMMOND, MILTON B. (M) engineering and sales, Gordon Mfg. Co., Toledo, O. (mail) 4241 Fairview Drive.

LANE, BUSTER WALLACE (J) engineer, Plymouth Division, Chrysler Corp., 6334 Lynch Rd., Detroit (mail) 241 Massachusetts Ave., Highland Park, Mich.

MANNING, LAURENCE ERNEST (M) engine production contact, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co., Pontiac, Mich. (mail) 1595 Inverness.

RILEY, EDWARD (M) chassis designer, Packard Motor Car Co., 1580 E. Grand Blvd., Detroit (mail) 16574 Griggs.

STRICKLAND, RUSSELL (J) sales engineer, Bower Roller Bearing Co., 3040 Hart, Detroit (mail) 1405 Balmoral Drive.

SWIFT, J. FREDERICK (J) laboratory engineer, Chevrolet Motor Division, General Motors Corp., Detroit (mail) 10637 E. Vernor Highway.

### Indiana Section

ALDRICH, GROVER HAROLD (J) jig and tool designer, Reeves Pulley Co., Columbus, Ind. (mail) 911 Chestnut St.

SWART, GILBERT HOLM (M) chief chemist, General Tire & Rubber Co., Mechanical Goods Division, Wabash, Ind. (mail) 109 S. Miami St.

### Metropolitan Section

FARIS, ROBERT MANN (M) engineer, Petroleum Conversion Corp., Elizabeth, N. J.

FLOOD, LEO P. (M) buyer, City of New York, Dept. of Purchases, New York City (mail) 6162 80th St., Maspeth, L. I., N. Y.

FRIEND, WALTER F. (M) mechanical engineer, Ebasco Services, Inc., 2 Rector St., New York City (mail) 9 W. 68th St.

JEROME, JACK (J) assistant chief engineer, Air Associates, Inc., Garden City, L. I., N. Y.

LEWIS, ROBERT B. (J) engine tester, Wright Aeronautical Corp., Paterson, N. J. (mail) 20 Liberty St., Passaic, N. J.

OLIVER, RICHARD M., LIEUT. COM. (SM) inspector, Naval Aircraft, U. S. Navy, Wright Aeronautical Corp., Paterson, N. J.

SHUMAKER, J. F. (M) field engineer, Bendix-Westinghouse Automotive Air Brake Co., 3420 Empire State Bldg., New York City.

### Milwaukee Section

CHILDS, ROYCE (J) engineer, Waukesha Motor Co., Waukesha, Wis.

STEVENS, BROOKS (A) designer, 340 N. Milwaukee St., Milwaukee.

### New England Section

CLARK, LEONARD T. (A) vice-president, H. S. Macomber & Co., Inc., 140 Brookline Ave., Boston.

### Northern California Section

AFFLECK, THEODORE HUBBARD (A) representative, Westinghouse Air Brake Co., 1101 Matson Bldg., San Francisco.

### Pittsburgh Section

GEMMELL, R. W. (M) sales engineer, Westinghouse Electric & Mfg. Co., Transportation Sales Dept., East Pittsburgh, Pa.

### St. Louis Section

BRUNDIGE, RAY H. (M) transportation engineer, Columbia Terminals Co., 400 S. Broadway, St. Louis, Mo.

COFFEY, IRVEN E. (M) engineer, Carter Carburetor Corp., 2820-56 N. Spring St., St. Louis, Mo.

### Southern California Section

BELL, WILLIAM T. (J) engineering, Douglas Aircraft, Inc., Santa Monica, Calif (mail) 5629 Hub St., Los Angeles.

BROOKS, JAMES B. (A) representative, Carter Carburetor Corp., St. Louis, Mo. (mail) 1611 S. Hope St., Los Angeles.

GILL, GEORGE H. (J) test engine, power plant, Consolidated Aircraft Corp., San Diego, Calif. (mail) 3212 Collier Ave.

GRETHER, FRED (J) senior detail draftsman, Lockheed Aircraft Corp., Burbank, Calif. (mail) 354 N. Cypress Ave.

MCCLISH, ERNEST A. (J) senior detailer, Vega Airplane Co., 923 E. San Fernando Rd., Burbank, Calif. (mail) 846 Cleveland Rd., Glendale, Calif.

MOORE, CHARLES CHILTON (M) research supervisor, Union Oil Co. of Calif., Wilmington, Calif.

NEMOY, WILLIAM (J) production control, Menasco Mfg. Co., 6917 McKinley Ave., Los Angeles (mail) 1953 Corning St.

NORTH, HENRY EMERSON, JR. (J) student engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif. (mail) 1127 18th St.

### Southern New England Section

BAKER, CARL F. (M) assistant chief engineer, Hamilton Standard Propeller Division, United Aircraft Corp., East Hartford, Conn. (mail) 35 Grandview Terrace, Wethersfield, Conn.

BECKER, ALFRED M. (J) service engineer, American Bosch Corp., 3664 Main St., Springfield, Mass. (mail) 274 Linden St., Holyoke, Mass.

FERMIER, REX M. A. (J) junior ordnance inspector, Hartford district, American Brass Co., Waterbury, Conn. (mail) 24 Hopkins St., Hartford, Conn.

HOWISON, ROBERT J. (A) general sales manager, Whitney Chain & Mfg. Co., 237 Hamilton St., Hartford, Conn.

### Outside of Section Territory

CASTOR, CLAUD EDWIN (A) sales engineer, Rex-Hide, Inc., East Brady, Pa.

KEKO, WILBUR L. (J) chemist, Commercial Solvents Corp., Research Dept., Terre Haute, Ind.

MECHLIN, FRED J. (A) director of laboratories, State of Louisiana, University, La. (mail) P. O. Box 3374.

SEWELL, JAMES L. (M) general superintendent, Taylor Refining Co., Box 778 Corpus Christi, Tex.

SNYDER, RAYMOND A. (M) assistant chief engineer, Sealed Power Corp., Muskegon, Mich.

### Foreign

DEWOITINE, EMILE (FM) chief engineer, Avions Dewoitine, 32 Blvd. de la Saussaye, Neuilly-sur-Seine, France.

MAKOWIECKI, STANISLAS (FM) engineer, Avions Dewoitine, 32 Blvd. de la Saussaye, Neuilly-sur-Seine, France.

MCFARLANE, WALTER JAMES (A) technical officer, A. G. Healing, Ltd., 167 Franklin St., Melbourne, Australia.

# Applications Received

**The applications for membership received between April 15, 1940, and May 15, 1940, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.**

### Baltimore Section

FRANCIS, WEBSTER HUNTINGTON, JR., aeronautical engineer, Glenn L. Martin Co., Baltimore.

PARKER, CARL J., industrial engineer, Quartermasters Corps, U. S. Army, Camp Holabird, Md.

### Canadian Section

RUSSELL, THOMAS BROWN, assistant to general manager, Canadian Acme Screw & Gear, Ltd., Toronto, Ont.

### Chicago Section

BRAND, EDGAR E., western sales manager, L. Sonneborn Sons, Inc., Chicago.

ERMINGER, DURWARD B., assistant manager, Service Department, International Harvester Co., Chicago.

TYLER, DONALD W., superintendent, mechanical operations, Eastern Division, United Air Lines, Chicago.

UNITED AIR LINES TRANSPORT CORP., Chicago.

WABER, JAMES W., president, The Waber Co., Chicago.

### Cleveland Section

STEWART, WILLIAM CLAYTON, technical advisor, American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland.

ZUVER, GEORGE H., sales engineer, Wagner Electric Corp., Cleveland.

### Dayton Section

SMITH, LEO M., graduate student, Ohio State University, Columbus, O.

### Detroit Section

ADAMS, CHARLES W., planning manager, The Electric Auto-Lite Co., Toledo, O.

BURNS, WILLIAM A., factory manager, Buhl Stamping Co., Detroit.

CROTTY, WILLARD E., assistant sales manager, Detroit Gasket & Mfg. Co., Detroit.

DANSE, L. A., chief metallurgist, Cadillac Motor Car Division, General Motors Sales Corp., Detroit.

DAVIS, DONALD K., engineer, W.G.B. Oil Clarifier Co., Inc., Detroit.

OUELLETTE, NORRIS, president, Power Battery Co., Richmond, Mich.

WAYNE, EDWARD H., die designer, Ford Motor Co., Dearborn, Mich.

### Kansas City Section

DAILY, P. H., district representative, Cummins Engine Co., Kansas City, Mo.

SYMON, HARRY J., student, Finlay Engineering College, Kansas City, Mo.

VANCIEL, M. LLOYD, tune-up engineer, Ethyl Gasoline Corp., North Kansas City, Mo.

### Metropolitan Section

BAYLESS, E. R., service engineer, Wright Aeronautical Corp., Paterson, N. J.

BRADY, GEORGE W., chief engineer, Curtiss Propeller Division, Curtiss-Wright Corp., Clifton, N. J.

BONIFACE, EDMUND A., JR., junior test engineer, Wright Aeronautical Corp., Paterson, N. J.

EVANS, PAUL IRVING, tester, experimental test laboratory, Wright Aeronautical Corp., Paterson, N. J.

HANINK, HERMAN H., assistant metallurgist, Wright Aeronautical Corp., Paterson, N. J.

HARRISON, WILLIAM THAYER, junior test engineer, Wright Aeronautical Corp., Paterson, N. J.

JUNTWAIT, ROBERT NELSON, experimental test engineer, Wright Aeronautical Corp., Paterson, N. J.

KITTREDGE, JOHN M., assistant project engineer, Wright Aeronautical Corp., Paterson, N. J.

LOWMAN, DONALD E., draftsman, Wright Aeronautical Corp., Paterson, N. J.

MEADOR, DUIS WESTON, test engineer, Wright Aeronautical Corp., Paterson, N. J.

ROWBOTHAM, GEORGE E., draftsman, Curtiss Propeller Division, Curtiss-Wright Corp., Clifton, N. J.

STARK, W. THOMAS, test engineer, Wright Aeronautical Corp., Paterson, N. J.

TEMPLETON, ROBERT READE, flight engineer, Wright Aeronautical Corp., Paterson, N. J.

VANNAH, SHERMAN, test engineer, Wright Aeronautical Corp., Paterson, N. J.

YATES, FRANKLYN B., district manager, Automotive and Industrial Division, The Timken Roller Bearing Co., Inc., New York.

### Milwaukee Section

FELDMANN, ALFRED H., assistant to research engineer, Briggs & Stratton Corp., Milwaukee.

### New England Section

JONES, FISKE R., chief engineer and director, Simonds Saw & Steel Co., Fitchburg, Mass.

### Philadelphia Section

BARR, VICTOR L., assistant chief engineer, Roller Bearing Co. of America, Trenton, N. J.

BOROWSKY, F. GORDON, vice-president, George K. Garrett Co., Inc., Philadelphia.

MCFADGEN, HENRY M., vice-president, Jacobs Aircraft Engine Co., Pottstown, Pa.

PALMER, RICHARD S., laboratory assistant, Sun Oil Co., Marcus Hook, Pa.

RICHARDSON, DAVID, Philadelphia representative, Chicago Rawhide Mfg. Co., Philadelphia.

### Pittsburgh Section

CHAMBLISS, CHARLES E., JR., zone manager, Fleet Sales Division, General Motors Corp., Pittsburgh.

EDWARDS, LEO M., foreman, automotive laboratory, Quaker State Oil Refining Corp., Emlenton, Pa.

HUGHES, CHARLES M., vice-president and treasurer, S & R Grinding & Machine Co., Pittsburgh.

### St. Louis Section

HAZARD, GEOFFREY CORNELL, manager, technical department, industrial lubricating oil sales, Lubrite Division, Socony-Vacuum Oil Co., Inc., St. Louis, Mo.

### Southern California Section

COYLE, DANIEL K., chief engineer, Diesel Western Co., Los Angeles.

DUMAS, JAMES R., JR., dispatcher, Menasco Mfg. Co., Los Angeles.

ELLINWOOD, H. RAY, president, Adel Precision Products Corp., Burbank, Calif.

FABER LABORATORIES, INC., Los Angeles.

GOOCH, JOEL M., draftsman, Menasco Mfg. Co., Los Angeles.

HOPPER, BASIL, research manager, Union Oil Co. of California, Wilmington, Calif.

HUTTON, HAROLD, Lube Marketing Dept., Richfield Oil Corp., Los Angeles.

KERSHNER, DANIEL C., sales engineer, Alox Corp., Alhambra, Calif.

LOTH, JOHN SMITH, draftsman, Rocky Mountain Steel Products Co., Los Angeles.

PRICE, EDMUND TABER, president and general manager, Solar Aircraft Co., San Diego, Calif.

SETNAN, MARSHALL, Hardman Metal Products Co., Los Angeles.

WILLIAMS, EARL, motor reconditioner, Psenner-Pauff Co., Glendale, Calif.

### Southern New England Section

CALVIN, JOHN H., test engineer, Hamilton Standard Propellers, Division United Aircraft Corp., East Hartford, Conn.

KLOCK, F. S., metallurgist, Hamilton Standard Propellers, Division United Aircraft Corp., East Hartford, Conn.

MCGREGOR, DOUGLAS, chief engineer, Indian Motocycle Co., Springfield, Mass.

MEYER, WOLFGANG E., laboratory and research engineer, American Bosch Corp., Springfield, Mass.

MOLL, EDWARD HAMACHER, factory manager, American Bosch Corp., Springfield, Mass.

### Washington Section

CORBIN, HENRY CLARK, field engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 2148 Wyoming Ave., Washington, D. C.

POWK, JOHN EDWARD, airplane and engine mechanic, Eastern Airlines, Inc., Arlington, Va.

ROTHROCK, ADDISON M., senior physicist, National Advisory Committee for Aeronautics, Langley Field, Va.

### Outside of Section Territory

LEGGETT, A. F., instructor, Ford Motor Co., Arabi, La.

LONGENECKER, E. A., executive vice-president, The Lauson Co., New Holstein, Wis.

SROGI, LADISLAW GERARD, draftsman, Lycoming Division, Aviation Mfg. Corp., Williamsport, Pa.

### Foreign

BURNESS, CAPTAIN THOMAS JOSEPH, War Office (MT Section) London, England.

EDWARDS, R. M., director and factory manager, Leggett Products, Pty. Ltd., Richmond, Victoria, Australia.

VOERMAN, J. J. C., chief, Rijks-Automobielcentrale, Hague, Holland.

# About SAE Members:

**L. CLAYTON HILL** has been elected vice president in charge of manufacturing of the Murray Corp. of America. He previously was general manufacturing manager. Mr. Hill is a member of the SAE Passenger Car Body Activity Committee and has served as its vice chairman.

**JOHN A. HERLIHY,** who has been serving as operating vice president of United Air Lines for the past year, has been elected executive vice president in charge of operations.

**A. P. BUQUOR,** who for ten years has been assistant to the president of Martin-Parry Corp., York, Pa., recently was appointed vice president of the company. He also is president of the Canadian subsidiary of the same name. Mr. Buquor is known for his development of the adapter by which field artillery of the United States Army and National Guard has been modernized for high-speed transportation and for development of other military transportation equipment. Mr. Buquor is now in Europe.

**B. C. HEACOCK,** president of the Caterpillar Tractor Co., Peoria, Ill., has been elected a vice president of the Chamber of Commerce of the United States.

**WALTER A. HAMILTON,** formerly in charge of the El Segundo, Calif., division of Douglas Aircraft Co., has been placed in charge of the company's newly-established materiel division.

As further evidence of his interest in agriculture, **HENRY FORD** announced last month his active cooperation in the establishment of the National Farm Youth Foundation which will provide scholarships for 20,000 farm youths throughout the country. The foundation, sponsored by the Ferguson-Sherman Mfg. Corp., Dearborn, with the cooperation of Mr. Ford and **EDSEL FORD,** president of the Ford Motor Co., will select farm youths between the ages of 18 and 25 for special training.

The medal of the American Institute of Chemists, presented annually for outstanding service to the science and profession of chemistry, was awarded, May 18, to **DR. GUSTAV EGLOFF,** director of research, Universal Oil

Dr. Gustav Egloff
Honored

Products Co. "The award," said Robert J. Moore, president of the Institute, in announcing Dr. Egloff's selection for this honor, "is made in recognition not only of Dr. Egloff's work in developing some of the most outstanding processes for the refining and treating of crude oils and gasoline; for his prodigious amount of publications in the fields of hydro-carbon chemistry . . .; for the issuance to him of over 250 patents . . .; but also for the outstanding service which he has given to the advancement of chemists."

**EUGENE EDWARD WILSON** has been elected president of the United Aircraft Corp., East Hartford, Conn., to succeed the late Donald L. Brown. Mr. Wilson was graduated from the United States Naval Academy in 1908, and during his naval service played an important part in the development of air-cooled radial engines. He served as chief of the engine section of the Bureau of Aeronautics from 1924 to 1926, and as chief of the design section during the next year. A qualified naval aviator, he also served with the Aircraft Squadrons Scouting Fleet and as chief of staff of the Aircraft Squadrons Battle Fleet. He resigned from the Navy in 1930 with the rank of Commander and was made president of the Hamilton Standard Propeller Corp., then a subsidiary of United Aircraft. Later he became president of the Sikorsky Aircraft Corp., another subsidiary, and still later president of a third subsidiary, the Chance Vought Corp. Since 1937, he has devoted his entire time to the office of senior vice president of the United Aircraft Corp.

***United Aircraft President***

Eugene Edward Wilson

## *SAE Members in Active War Service*

From abroad comes news of additional SAE members actively engaged in military service.

**Lt.-Col. J. C. Mackie,** Royal Army Service Corps, is engaged in active war service in the British Army. **Albert Vere Oliver** writes that on March 8 he took up the appointment as experimental assistant, grade I, in the Mines Design Department of H.M.S. Vernon, an Admiralty Department at Portsmouth, England.

Word has come from France that **Jean Dentan,** general manager of Air France, has been a commissioned officer with the French Air Force since the beginning of the war. **Charles B. Brull,** general manager of factories, Societe Francaise des Munitions, has been appointed captain assistant to the colonel in command of the French Army General Automobile Stores.

**Yrjo Leiviska** wrote from Helsinki, Finland, on April 5, that on Feb. 21 he entered the military service of his country and "will be moved to a small place to take a military course in motor transportation."

**C. H. Buitenhuis,** in charge of the material division, N. V. Nederlandsche Vliegtuigenfabriek, Amsterdam, Holland, advised the Society, in a letter dated March 17, that he is mobilized as a first lieutenant of the Army Transport Corps.

**J. CARLTON WARD, JR.,** vice president and a director of United Aircraft Corp. and general manager of its Pratt & Whitney division in East Hartford, Conn., has resigned. Mr. Ward joined the organization in 1935 as assistant to the general manager at Pratt & Whitney, and two months later became assistant general manager. Since November, 1938, he has been vice president of United Aircraft and general manager of the division.

**GROVER LOENING,** inventor of the strut-braced monoplane and president of the Grover Loening Aircraft Co., Garden City, N. Y., has received the Egleston Medal for "distinguished engineering achievement," which is awarded by the Columbia University School of Engineering. The presentation was made at the Columbia Engineering School Alumni Association's annual dinner, May 2. Mr. Loening is a member of the Columbia Engineering Class of 1911.

**BRUNO V. E. NORDBERG,** executive engineer, Nordberg Mfg. Co., Milwaukee, has been named honorary chairman of the summer meeting of the American Society of Mechanical Engineers to be held in Milwaukee, June 17-20.

**O. L. BARD,** for the past 17 years secretary of the Michigan Tool Co., and identified with it almost since its inception, has been elected president and treasurer of the company.

**W. B. HURLEY** has been appointed assistant district chief of the Detroit Ordnance District by Major-Gen. C. M. Wesson, Chief of Ordnance, United States Army. Mr. Hurley, who is staff engineer, Detroit Edison Co., served in the Ordnance Department under General Wesson in the World War. Vice president of the SAE representing Production Engineering in 1939, Mr. Hurley now heads the special programs committee for the Detroit Section.

W. B. Hurley
Gets Ordnance Post

**D. S. EDDINS,** president, Plymouth Division of the Chrysler Corp., recently received, upon behalf of his company, an award for outstanding safety design. The award was sponsored by the publication *Safety Engineering*, and the presentation made at the Greater New York Safety Conference, April 18. This is the second year that Plymouth has won this award.

A revised edition of **LESTER C. LICHTY'S** book, "Internal Combustion Engines," recently was published by the McGraw-Hill Book Co., New York. In the preface, Prof. Lichty writes, "This volume is more than a revision of the book by the same title which was first written by the late Robert L. Streeter in 1915. The second edition appeared in 1923, the principal changes being made in four chapters prepared by E. E. Adams, T. E. Butterfield, G. A. Goodenough, and L. H. Pomeroy. The undersigned assumed full responsibility for the third and fourth editions in 1920 and 1933 and now

assumes full authorship for this edition. . . ." The author is associate professor of mechanical engineering, School of Engineering, Yale University.

**DAVID BEECROFT,** Bendix Aviation Corp. and a past president of the Society, and **CHARLES B. KING,** who built and drove the first motor car over the streets of Detroit in 1894, have been elected second and third vice presidents, respectively, of the recently organized Automobile Oldtimers, Ltd.; an association comprised of men who have been affiliated with automotive pursuits for 25 years or more.

**E. J. KASNICKA,** Lockheed Aircraft Corp., Burbank, Calif., visited SAE Headquarters while in the East to attend the April 17 meeting of the SAE Aircraft Standards Division held in Buffalo. Mr. Kasnicka is western vice chairman of the division.

**PROF. JEROME C. HUNSAKER,** head of the departments of mechanical engineering and aeronautical engineering at the Massachusetts Institute of Technology, is chairman of a committee in charge of the Conference on Friction and Surface Finish to be held at the Institute, June 5-7. Participating will be scientists, engineers, and research leaders of industry. Among those presenting papers and discussion will be **D. A. WALLACE,** president, Chrysler Sales Division, Chrysler Corp.; **ARTHUR NUTT,** president of the SAE and vice president for engineering, Wright Aeronautical Corp.; and **J. C. GENIESSE,** research engineer, Atlantic Refining Co. Serving as session and discussion chairmen will be **MAURICE OLLEY,** Rolls Royce, Ltd; **RAYMOND HASKELL,** The Texas Co.; and **H. C. MOUGEY,** General Motors Research Laboratories.

**BEN F. HOPKINS,** president, Cleveland Graphite Bronze Co., and **F. C. CRAWFORD,** president, Thompson Products, Inc., have been elected trustees of the Cleveland Engineering Society to serve three years.

**NORMAN DAMON, director of the Automotive Safety Foundation, who, with his staff, opened the Foundation's new offices in the Tower Building, Washington, D. C., on April 22.**

**The Foundation previously had been located in New York.**

**RAYMOND SZYMANOWITZ,** technical director, Acheson Colloids Corp., and his staff are located at the company's new research laboratories in Newark, N. J.

**W. A. MUDGE,** who was metallurgist, development and research division, The International Nickel Co., Inc., New York, has been named assistant director of technical service.

**DAVID J. WHITSON,** formerly service manager of the Albany Motor Co., Albany, Calif., has moved to Hawaii where he has joined Murphy Motors, Ltd., Honolulu.

**HARLOW H. CURTICE,** who has been general manager of the Buick Motor Division since 1933, last month was named a vice president

**G.M. Vice President**

Harlow H. Curtice

of the General Motors Corp. When he started work some 20 years ago, Mr. Curtice was employed in the accounting department of the AC Spark Plug Co. He advanced through the offices of comptroller, assistant general manager, and vice president, to that of president in 1929. It was from that post that he joined Buick.

**MAURICE GREEN,** formerly associated with Simmonds Aerocessories, Ltd., London, has joined Rolls-Royce, Ltd., Derby, as designer in its 2-stroke division. Mr. Green recently was admitted as an Associate Fellow of the Royal Aeronautical Society.

**THEODORE L. SWANSEN** represented the SAE Milwaukee Section on the committee arranging the Wisconsin Engineering Conference, Milwaukee, March 13-15, and was chairman of the Conference publicity committee. Section Chairman **W. F. STREHLOW** presided at the closing session which was an open meeting of the Milwaukee SAE Section.

**R. JACK BRUN,** vice-chairman of the SAE Student Branch at Oregon State College, has received a scholarship to Yale University as a graduate assistant in mechanical engineering. Mr. Brun was secretary-treasurer of the Student Branch last year.

**F. LESLIE JACOBUS,** formerly in the service and engineering department of Wright Aeronautical Corp., Paterson, N. J., has joined the Sun Oil Co., New York, as automotive engineer.

**J. B. RATHER,** Socony-Vacuum Oil Co.; **R. W. BAYERLEIN,** Nordberg Mfg. Co.; and **J. RUSSELL PYLES,** Clark Bros. Co., are SAE members scheduled to present papers at the oil and gas power sessions of the 1940 semi-annual meeting of the American Society of Mechanical Engineers, Asbury Park, N. J., June 19-22.

A prediction that the automobile of the future will get double the power or travel nearly twice as far on a gallon of gasoline as the cars of today, was made by **T. A. BOYD,** director, fuel laboratories, General Motors Corp., at a dinner given April 29 by the Franklin Institute, Philadelphia, honoring The Atlantic Refining Co. for its pioneer work in many fields relating to the refining, transportation, and marketing of petroleum products.

**HSUE-CHU TSIEN** recently became associated with the Universal Trading Corp., New York.

**S. CORWIN BRITTON,** formerly chemist in charge of the Kansas City (Kan.) section, development division, Phillips Petroleum Co., has been transferred to the company's headquarters, Bartlesville, Okla., as research chemist.

**EDWARD W. McVITTY,** division engineer, Pan American Airways Co., New York Municipal Airport, North Beach, was guest speaker at the annual dinner of the Commerce Club of Manhattan College, held May 11.

The marriage of **GEORGE KRIEGER** and Miss Ruth Adams took place in Beverly Hills, Calif., April 23. Mr. and Mrs. Krieger will make their home at the Dearborn Inn, Dearborn, Mich. Mr. Krieger is experimental engineer, Ethyl Gasoline Corp.

**ROBERT A. HERMANN,** formerly with the Glenn L. Martin Co., Baltimore, as inspector, is junior aeronautical engineer at Wright Field, Dayton, Ohio.

**HARRY A. MACK,** manager of the Dayton division of the Ethyl Gasoline Corp., recently was named a member of the University of Dayton's board of trustees.

**PIERRE SCHON,** after rounding out a quarter century with Yellow Truck & Coach Mfg. Co. and its predecessors, resigned from his position as transportation engineer to take over the dealership for GMC trucks in Jacksonville, Fla., under the name of General Truck Co. He is

**Pierre Schon**
Takes Dealership

president of the new company which is GMC dealer for Duval and the six northeast Florida counties. Mr. Schon has been a member of the SAE since 1919, active on the Transportation & Maintenance Committee of the Society, and a frequent speaker at its meetings. Born in Luxemburg, Mr. Schon received his early education in France and served his apprenticeship at the Panhard Levassor automobile factory in Paris. He did some racing on the Continent, and in 1904, in his first contact with transportation problems, used a 90-hp Mercedes to rush copies of a Paris newspaper to Le Havre where they were put on the midnight channel boat, reaching London readers 24 hours earlier than had been done before. That feat brought him an invitation to come to the United States to set up a motorized delivery system for the *Kansas City Star*. He accepted. In 1912 he became branch manager for Mack in Kansas City and two years later started his long career with Yellow Truck & Coach.

At a recent meeting of the Plymouth Corp. board of directors, **E. S. CHAPMAN** was elected vice president in charge of production,

***Advanced by Plymouth***

E. S. Chapman

to succeed the late P. C. Sauerbrey. He also has been appointed assistant general manager. Mr. Chapman, who was general works manager of Plymouth prior to his promotion, joined the Chrysler organization in 1928. He served as staff master mechanic for K. T. Keller; assistant operating manager of the Highland Park plant; operating manager of the New Castle, Del., plant; and participated in the organization of the Amplex Division, which developed Chrysler's Oilite bearing and handled the production and distribution of a number of Chrysler products, other than automotive vehicles. In the fall of 1937, Mr. Chapman joined the Plymouth Division as general works manager.

**DR. ENG. DARIO FINZI,** formerly of Ferrara, Italy, now is located in Rio de Janeiro, Brazil.

SAE members serving on the advisory committee for tenth Stevens Conference of Business and Engineering Administrators to Further Management Problems include **EDWARD R. STETTINIUS, JR.,** chairman of the Board, U. S. Steel Corp.; **RALPH E. FLANDERS,** president, Jones & Lamson Machine Co.; and **LESTER M. GOLDSMITH,** chief engineer, Atlantic Refining Co. Sessions will be held June 22-30 at the Engineering Camp of Stevens Institute of Technology, Johnsonburg, N. J.

The National Advisory Committee for Aeronautics commemorated its 25th anniversary with a reunion luncheon of present and former members at the Army & Navy Club, Washington, April 18. SAE members among those serving on the NACA are: **GEORGE J. MEAD,** vice-chairman of the committee; **ORVILLE WRIGHT; PROF. JEROME C. HUNSAKER,** head of the departments of mechanical and aeronautical engineering, Massachusetts Institute of Technology; and **EDWARD P. WARNER,** Civil Aeronautics Authority. SAE members on the NACA staff include: **DR. GEORGE W. LEWIS,** director of aeronautical research; **H. J. E. REID,** engineer in charge of the Langley Field laboratories; and **JOHN J. IDE,** the Committee's technical assistant in Europe. At the luncheon it was announced that, with the approval of the President, the new laboratory at Moffett Field, Sunnyvale, Calif., would be named the "Ames Aeronautical Laboratory" in honor of Dr. Joseph S. Ames, NACA chairman for 20 years, who retired in 1939.

**ROY W. BROWN,** automotive research division, Firestone Tire & Rubber Co., who is chairman of the SAE Riding Comfort Research Committee, is author of an article titled "Present Status of Instruments for Measuring Riding Comfort," appearing in the April issue of *Instruments*. This article brings to date the Riding Comfort Research Committee report presented at the 1938 Summer Meeting. Mr. Brown will present a paper on "Engineering Properties of Rubber in Compression" at the 1940 SAE Summer Meeting, White Sulphur Springs, W. Va., June 9-14.

**WENDELL H. WELCH,** formerly assistant director of service, Chrysler Corp., export division, has been appointed sales promotion manager.

Among SAE members participating in the 44th annual convention program of the American Foundrymen's Association in Chicago last month were: **W. H. SPENCER,** Wilkening Mfg. Co.; **H. BORNSTEIN,** Deere & Co.; **V. H. SCHNEE,** Battelle Memorial Institute; **E. K. SMITH,** Electro Metallurgical Co.; **F. J. WALLS,** International Nickel Co.; **D. P. FORBES,** Gunite Foundries Corp.; **ENRIQUE TOUCEDA,** Malleable Founders' Society; **R. J. ANDERSON,** Belle City Malleable Iron Co.; and **D. I. DOBSON,** General Malleable Corp.

**JOHN L. BUXTON** has established a plant in Philadelphia for the production of automatic screw machine parts. Prior to coming to this country in 1938, Mr. Buxton was assistant manager of Ceskomoravska Kolben-Danek (C.K.D.), Prague, Czechoslovakia, in charge of the aircraft-engine department.

**JOHN S. NAERY,** formerly manager of the Milwaukee office for Donaldson Co., Inc., is with the J. I. Case Co., Racine, Wis., assisting the vice president of manufacturing on a special assignment.

Seven SAE members have been advanced in changes announced by the Cleveland Graphite Bronze Co., Cleveland. **J. J. McINTYRE,** vice president and general manager, has been appointed senior vice president. **JAMES L. MYERS,** secretary and treasurer, is now executive vice president; **CARL W. JOHNSON,** director of sales, advanced to vice president in charge of sales; **JOHN V. O. PALM,** chief engineer, is now vice president in charge of engineering and research; **GEORGE S. SALZMAN,** works manager, becomes vice president in charge of manufacturing; and **L. W. CHRISTENSON** and **DREW McKENNA,** sales engineers, have been made assistant sales managers.

SAE President **ARTHUR NUTT,** vice president for engineering, Wright Aeronautical Corp., spoke before a group of affiliated technical societies at Norfolk, Va., April 26, and addressed the chapter of Sigma Xi fraternity at Worcester Polytechnic Institute, his Alma Mater, on May 6. Sharing the program with Mr. Nutt at Norfolk was **T. P. WRIGHT,** vice president and director of engineering, Curtiss-Wright Corp.

**FREDERICK T. FINNIGAN,** formerly a student at Tri-State College of Engineering, recently joined the Pure Oil Co., Chicago.

**VAN TURNER,** editor of CHEXALL, has been appointed sales promotion manager of the Chek-Chart Corp., Chicago. He will handle his new duties in addition to his editorial work. Mr. Turner joined the Chek-Chart organization in 1936, having been previously connected with the book department of the Chilton Co. as editor of their Flat Rate Manual and other technical books, and with the Standard Technical Co. in a similar capacity. Subsequent to that, he handled service complaints and adjustments for Chevrolet at the Philadelphia

Van Turner
Adds to Duties

zone office. Mr. Turner is active in the SAE and now is chairman of the Chicago Section's publicity and section publication committee.

**NORMAN E. MILLER** recently resigned after five years as chief research engineer in charge of laboratories and new developments for Vickers, Inc., to become president of Norman E. Miller & Associates, Detroit, a recently organized firm of consulting hydraulic and mechanical engineers. The new concern specializes in the application of fluid power and general hydraulic engineering for the industry. Mr. Miller, prior to his association with Vickers, had been affiliated with the ExCello Corp. in a similar capacity, and was for many years active in the automotive industry, having been associated with Cadillac, Lincoln, and Chrysler.

***Knudsen Defines "Engineer"***

**"There's nothing for a young man like the experience of taking something apart and putting it together again. After he has done this with his hands, he can do it in his mind . . .**

**"And when he can do it with his mind – then he is an engineer!"**

**– W. S. Knudsen**

*(at a dinner preceding the opening of the General Motors exhibit at the 1940 New York World's Fair)*

A personal gift of $25,000 by **ALFRED P. SLOAN, JR.,** chairman of the board, General Motors Corp., to the Automotive Safety Foundation, provides fellowships for 19 state highway engineers and state police officers to be given a full year of training at Yale and Northwestern Universities during the 1940-1941 academic year, it has been announced by **PAUL G. HOFFMAN,** president of the Foundation.

**EARL P. OSBORN** has resigned from the Air Safety Board, Civil Aeronautics Authority, Washington, to join the Brewster Aeronautical Corp., Long Island City, N. Y., as aeronautical engineer.

**MAJOR R. O. MONTGOMERY,** Field Artillery, United States Army, formerly at Fort Sill, Okla., after June 15 will be located in New York as instructor of Organized Reserves.

**K. F. PITTMAN,** formerly engineer with Standard Carriage Works, Inc., Los Angeles, has joined the engineering department of the Lockheed Aircraft Corp., Burbank, Calif.

**RAYMOND F. STEVENSON,** formerly a member of the SAE Student Branch at the University of Oklahoma, is junior aeronautical engineer, Materiel Division, Wright Field, Dayton, Ohio.

## *Hugh A. Gillies*

Hugh A. Gillies, vice president for sales, American Brakeblok Division of the American Brake Shoe & Foundry Co., Detroit, died April 23 while in New York on a business trip. He was 58 years old and had been a member of the Society since 1930.

Mr. Gillies, a native of Macomb, Miss., started his career as a machinist and mechanical engineer in the railroad industry, working for a number of companies in the United States and Mexico between 1905 and 1915. In the latter year he became affiliated with the American Brake Shoe & Foundry Co., and shortly afterwards was placed in charge of production and sales of the Denver plant. Then came a period with the American Brake Materials Corp., automotive and industrial division of the American Brake Shoe & Foundry Co., during which he was engaged in the development of automotive brake frictional materials. He later was made sales manager. When the American Brakeblok Division of the company was organized in 1928, Mr. Gillies was named vice president in charge of sales.

## *Robert J. Pritchard*

Robert J. Pritchard, vice president and editorial director of the Occidental Publishing Co., Los Angeles, and former editor of *Western Flying,* one of its publications, died April 9 of injuries received in an automobile accident seven days before.

After many years on newspapers in Arizona, Texas, and California, Mr. Pritchard, with V. L. Ehrenclou, founded the Occidental Publishing Co. in 1925 to publish *Western Flying.* He was among the 12 pioneers who organized the 1928 National Air Races in Los Angeles, the first of the famous series to become an international classic.

In October of last year, Mr. Pritchard left *Western Flying,* of which he then was editor, to go to Baltimore as director of public relations for the Glenn L. Martin Co. He returned to Los Angeles in February to take his post with Occidental Publishing as vice president and editorial director. He became an associate member of the SAE last year.

# News of the Society

(*Continued from page 16*)

in the vitrified products, pores are available through which coolant and lubricant may pass and into which metal chips and grinding swarf may penetrate. He pointed out further that organic bonds are softened by the coolants and lubricants employed and that they are susceptible to heat generated in abrasive operations, with release of dulled abrasive particles often taking place as a result of the effect of the heat on the bond. Dr. Milligan showed that the stresses involved which are the cause of the abrasive grains being worn away or torn out are resolvable into tensile and compressive stresses and concluded that both tensile and compressive characteristics of abrasive bodies must be known and "weighted" in order to predict their performance in use.

Studies of coarser grit bond abrasives have disclosed that steels of similar chemical composition and Rockwell or Brinell hardnesses have varied as much as 50% in grindability under precisely similar conditions, reported P. H. Walker, The Carborundum Co. Summing up his prepared discussion he concluded that the data presented suggest a good empirical means of classification of fine stones within a limited range; that the results suggest possibilities of future extension; and that finishing machines should be provided with means for adjusting to commercially available limits of abrasive manufacture.

### Controlling Finish in the Shop

The "look" and "feel" of a surface have practical importance, and justly so, maintained R. F. Gagg, Wright Aeronautical Corp., in presenting the session's second paper: "Surface Finish Control in Machine Shop Practice." Any measurement of roughness, he continued, must be demonstrably related to these two intangibles. He declared that the unaided eye can match degrees of surface roughness on similar parts finished by similar processes with a relatively small error. Experimentation with the finger or finger nail, he said, will show remarkably acute perception of surface roughness provided that the finger is drawn over the surface at a velocity which transmits vibrations to the nerve ends at the frequency resulting in maximum response to stimulation. He pointed out, however, that the great trouble with this form of roughness measurement is that the results are purely personal and promote rather than resolve questions of surface quality. Mr. Gagg went on to describe various instruments being used commercially to measure surface roughness, pointing out advantages and limitations of each. "No instrument now available represents the acme of accuracy," he contended, calling attention to the need for a standardized procedure for the proof of accuracy to be provided by cooperative action.

Turning to shop control of surface roughness, he discussed methods of marking drawings to specify surface roughness, pointing out the advantages of using separate drawings or tables for such specifications. He brought out that the use of a surface-roughness measuring instrument has made it possible to obtain an immediate indication of the effects of process changes.

E. S. Marks, Pratt & Whitney Aircraft, was the first called on to discuss Mr. Gagg's paper. His prepared discussion told of the practice and problems in controlling surface finish in his plant.

A member of the Committee for Surface Roughness of the American Standards Association, F. O. Hoagland, Pratt & Whitney Division, Niles-Bement-Pond Co., was the next to comment on Mr. Gagg's paper.

He pointed out that the proposed standard is on trial for two years and full publicity is helpful. Drawing attention to the fact that the standard has been built up around the Profilometer and its meter calibrated in r.m.s. (root mean square) values, he brought out that very few engineers understand the r.m.s. values and suggested that arithmetic averages may be preferable. He asked whether the Brush "Surface Analyzer" should be ruled out of the proposed standard because it uses a different scale or whether the standard should be broadened in its scope.

Discarding both his coat and his Ph.D. temporarily, Dr. E. J. Abbott, Physicists Research Co., impersonated "Ernie the machine setter" to demonstrate how the Profilometer is applied to regular machine-shop operation. Returning to his usual character, he displayed slides showing typical applications of the instrument.

Joseph Geschelin, Chilton Co., brought out that the finish roughness of certain surfaces was measured in millionths of an inch. He pointed out the need for some scale to indicate the quality of such surfaces. He reported that he had observed recently an increased application of the Profilometer in automotive shops.

That there is a field of application for both the Surface Analyzer and the Profilometer was contended by H. S. Kartsher, Brush Development Co. His view was seconded later by Dr. Abbott. "In defining surface roughness we are going through the same growing pains experienced in screw threads before they were standardized," Mr. Kartsher observed. He

## *New Aeronautical Material Specifications Available*

**New SAE Aeronautical Material Specifications consisting of some 100 individual specifications covering processes, non-metallics, ferrous and non-ferrous metals used for aircraft, aircraft engines, and in major accessory equipment, will be available from the SAE Standards Department early this month.**

**These specifications are complete enough for use in the purchase and acceptance of materials, differing therein from existing more general SAE Standards for steels, non-ferrous metals, and other materials.**

**The individual specifications are on 8½ x 11 in. sheets punched for standard ring binders. They sell for 5c each to SAE members and 10c each to non-members. The entire lot of specifications also will be available in bound form. The price for the volume may be had upon request.**

predicted that the ultimate result will be standards of numbers and classifications for surface finish, similar to those in use for screw threads.

"Although most records pertain to the r.m.s. of surface finish, our problems are concerned more with deep scratches which cause razor-blade breakdown," contributed David H. Harris, Gillette Razor Co.

The author's discussion of visual method of comparison was "depressing" to Mr. Kline who expressed his "profound belief" that instruments must be used. He pointed out that the visual results depend upon whether the eye looks across the direction of grinding or parallel to it and that, because of this angle, the result may be very deceiving. He contended that a criterion other than the r.m.s. value is necessary as two surfaces entirely different in character may have the same r.m.s. reading.

Replying to Mr. Hoagland, Mr. Gagg contended that objections to the r.m.s. scale will disappear as soon as the men in the shop get used to working with it. Speaking of the definition for surface finish, he explained that "surface smoothness" was preferred but no way could be found to define it except in terms of "surface roughness," the term finally recommended.

## Franzen Cites Advances In Vehicle Suspensions

● **Buffalo**

"Notes on Recent Developments of Passenger Motor Vehicle Suspensions," was the topic of Tore Franzen's talk before the Buffalo Section's May 7 meeting. Mr. Franzen, who is experimental engineer of the Chrysler Corp., included in his discussion the springing medium, the shock absorbers, sway bars, and seat cushions.

Suspension Springs he divided into three major groups: 1. springs made of steel; 2. springs in which air or other compressible gases are used as a flexible medium; and, 3. springs made of rubber or its substitutes.

He discussed the individual types of springs under each of these main headings, and reported advances made in designs and materials that are being utilized to improve riding comfort.

Stressing the importance of weight distribution, Mr. Franzen stated: "No matter how good we make the springs, the shock absorbers, the shackles, and the seat cushions, we would have a bad ride unless the weight distribution in the car is reasonably correct."

He concluded his talk with a few words on ride meters. Any number of fine instruments which record accelerations are available, he said, yet there is no definite tie-in with the fatigue factor of the vehicle occupant. He referred to the fatigue meter developed by Dr. Moss of George Washington University as coming nearest to a practical solution. The objection to this device, he said, is that for accuracy it is necessary to have a number of human subjects whose reactions can be measured and their average taken.

## C. G. A. Rosen Traces Diesel Engine Strides

● **Indiana**

Trends in the development of diesel engines were discussed by C. G. A. Rosen, assistant chief engineer in charge of diesel research, Caterpillar Tractor Co., at the Indiana Section's April 11 meeting. Despite an April blizzard more than 50 attended the dinner and late arrivals brought the total attendance over the hundred mark.

Visiting the Section was E. F. Lowe, SAE assistant general manager, who briefly spoke on activities of other sections of the Society. Section Chairman McColloum introduced the two speakers.

# Engineers Debate What Car Owners Want in Automatic Transmissions

● **Detroit**

A MANY-SIDED analysis of the desirable characteristics of an automatic transmission resulted at the April 8 meeting of the Detroit Section, when the speaker of the evening and a large group of discussers entered into heated debate to determine the transmission engineer's goal and his means of reaching it.

S. O. White, director of engineering, Warner Gear Division, Borg-Warner Corp., launched the technical discussion with his paper "What Are the Desirable Characteristics of an Automatic Transmission?" The average driver, he asserted, probably does not want the theoretically "right thing at the right time" but does want an automatic transmission to do his clutch work and gear shifting for him as a relief from a certain amount of skill requirement and manual effort. Features of economy, performance and safety, he said, will continue to be somewhat overlooked by the public which will regard the automatic transmission principally as a labor-saving device.

The engineer, however, must not let this labor-saving feature get in the way of economy, performance and safety, nor of reliability, smoothness and quietness of operation, he contended. Moreover, whatever form the automatic transmission takes, Mr. White insisted, it must make the minimum change in driver-habits and it must not take away from the driver the control of the car.

"After all, he (the driver) still wants to drive, and traffic conditions may cause him to want to do something that is not theoretically correct. If the automatic controls, or brain of the transmission, will not let him do this, he will not be satisfied with the result," Mr. White commented.

The steam-propelled automobile of a quarter century ago approached, in a comparatively simple way, what the industry now seems to be seeking through an elaborate and complicated mechanism, Mr. White asserted. He leveled criticism at the complication of parts involved in mechanical gear shifters with step-to-step transmission, stating that such complication is apt to go beyond anything "that would have been considered practical a few years ago, or that seems justified by the results." He emphasized again that in making the transmission automatic there must still be left in the driver's hands some overruling manual control to counteract almost everything that the automatic controls do.

Dwelling on the psychological demands of the driver and the exigencies of traffic conditions, Mr. White said further that in addition to making gear shifting automatic, the engineer must continue to allow the driver to retain, at will, almost the same amount of control that he has always had.

The fluid coupling that has recently come into the field would seem to point logically, as the next step forward, "to its near relative, the fluid torque converter of turbine type," Mr. White suggested. The torque converter, he added, has not only the smoothness of the coupling, "but in addition has properties of torque increase such that it is clutch, coupling, and transmission all in itself. It is an infinitely variable transmission that can be designed for a definite range, starting, for example, at about a three-to-one ratio and working up to nearly one-to-one, where it functions substantially as a fluid coupling," Mr. White explained.

Agreement that an infinitely variable speed transmission which would meet 100% the requirements of an automobile, would be the most desirable type transmission from the engineering viewpoint and the driver's standpoint, was voiced by Oscar H. Banker, vice president, New Products Corp., Chicago. However, he declared, such a device is not yet available and that it is questionable whether it will ever be available with the simplicity of, and at a cost comparable to, the automatic transmission of the step-gear type. He disagreed that a fluid torque converter, actually practicable for automotive use, would be a simple device and easy to control. Extraneous functions assigned to the transmission, in addition to acceleration, would cause complications. Even state laws requiring specific functions of transmissions would have to be met, he declared. Therefore, in order for the torque converter to be an acceptable device, all of these added functions must be attached to it, he continued. The transmission, Mr. Banker pointed out, must serve as a stop-gap for the shortcomings of other units in the automobile. For instance, he stated, it must be capable of being locked in second or low gear while going down a long, steep grade, using the engine as a brake. This, he averred, is due to the deficiency of the brake, but is, however, the general practice and is law in many states. Again, he reminded his listeners, cars must be pushed to start the engine when the battery is low. In this case the transmission must function positively to overcome the shortcomings of the starting system.

He added that fluid turbines must have reverse and forward gear arrangement to select directions and that some form of direct drive must be used at top speeds to overcome inefficiencies. He also stated that the intense heating and boiling tendencies made it necessary to add pumping units, cooling units and various controls and safety features so that in the long run the torque converter becomes much more complicated than the gear type of automatic transmission now available.

Concluding, he commended passenger-car producers who have displayed aggressiveness and pioneering courage in promoting the devices that are available rather than waiting for that "unpredictable day when the millennium of automobile driving shall have arrived through the evolution of an infinitely variable transmission embodying the indispensable elements of economy, efficiency, simplicity and practicability."

### Overruling Control Questioned

Disagreeing that the automatic transmission must incorporate overruling control, Karl B. Britton, vice president, Britton Controls, Inc., Cleveland, declared "if any automatic device *needs* overruling control, it is evident that it does *not* 'do the right thing at the right time' – if it does, why overrule it?"

Mr. Britton asserted that if car manufacturers actually want overruling controls, they add no complication – "just a push button and a couple of feet of wire will do the trick." He pointed out that the automatic spark control does a better job on controlling than the driver could, and that a really good "brain unit" can do a better job of controlling the transmission than the driver can. With such a "brain unit," he stated, it is not necessary that the automatic transmission permit the driver to "force down" to a lower geared speed to

meet special conditions, since the "brain unit" will automatically take care of all situations including, of course, such as require a shift down to a lower gear. He defined the "brain unit" as one that responds to both speed and torque.

"Unless an automatic device does do a better job of shifting than the driver can do manually, it should never be installed at all," Mr. Britton emphatically stated. He added that a properly controlled automatic transmission will ease demands on the engine considerably so that the powerplant will never operate with full throttle below, say, 1800 rpm and that it will never drive the car at all below about 600 rpm. In addition, it will be impossible for the driver to speed up the engine to more than about 3200 rpm, except in top gear.

Roscoe C. Hoffman, Hoffman Motor Development Co., raised the question of temperature rise in torque converters, while Herbert Snow, Columbia Axle Co., suggested that speed changes, or gear shifting, should be made contingent upon some specific driver operation; in other words, that the driver should operate some device such as a lever or button when he wants to change speeds, or just previous to the desired change. Mr. Snow reiterated that shifting down under power is necessary at times and that it is also necessary, on occasion, to shift down with the throttle closed. Another reason suggested for putting some of the control in the hands of the driver is that everyone does not desire maximum acceleration at all times. There are times when drivers prefer to remain in a higher gear ratio and accelerate more slowly.

### Prejudice Laid to Early Devices

D. T. Sicklesteel, chief engineer, Detroit Gear & Machine Division, Borg-Warner Corp., took issue with Mr. White's objections to the step-type automatic transmission, asserting that Mr. White's condemnation was based on faults observed in the past which were inherent in transmissions that were often "half-baked, poorly developed, unnecessarily complicated, and based on theories which were faulty and incomplete." The earlier, faulty devices have generated prejudice, Mr. Sicklesteel declared.

Recent developments have made possible a degree of simplification that compares very favorably with the present-day combination of clutch, transmission and overdrive, Mr. Sicklesteel said. These recently developed transmissions accomplish not only the results obtained by the conventional devices, but also add complete automatic operation with equal or less weight, cost, and size. The step-type automatic transmissions he had in mind included overruling control to handle the emergency of acceleration, lower speed engine braking and cold engine conditions, "and this without having objectionable complications." Desirable control characteristics can be obtained by a combination of speed and torque control, he said, with this type of transmission. If the throttle be held open, he explained, the car will stay in low or second gear up to the maximum speed at which favorable car performance can be obtained in that gear. If the throttle is opened only enough to accelerate the car, it will reach the higher gear at the desired low car speed. It can also be made to stay in high gear at low car speed unless the operator opens the throttle sufficiently to indicate that he desires a greater acceleration which can be obtained only in lower gear.

Mr. Sicklesteel also challenged statements that the fluid couplings smoothed out the "gap in the step-type transmission." He said that although the inherent slip at low speeds provides smooth starting, the fluid coupling characteristics do not permit much smoothing out of shift at speeds above its stall-speed, as the drive is quite positive at such speeds.

## Tractor Exhibit Draws 2000; Meeting Jammed

JOE E. ROBBINS, manager, technical department, Paramount Pictures, Inc., who told Southern California Section members the engineering problems involved in quieting gasoline powerplants for generators used on location in motion picture work.

● **So. California**

More than 2000 people were attracted to Southern California's first annual Tractor & Industrial Power Exhibit, April 12-13, held in Los Angeles by the SAE Southern California Section. Engines, tractors, farm equipment, and road building machinery were displayed in a parking lot adjacent to the Los Angeles Elks Temple, while parts, service equipment, and accessories were to be seen in the Temple's open-air patio.

On the evening of the exhibit's opening more than 200 Southern California members and guests heard J. H. Wallace, chief engineer, Pacific Enterprise Products Co., and Joe E. Robbins, manager, technical department, Paramount Pictures, Inc., at the Tractor & Industrial Engineering Dinner. Toastmaster for the occasion was Dean P. S. Biegler, College of Engineering, University of Southern California, and Farley E. Beckett, instructor in diesel engineering, Frank Wiggins Trade School, led the technical discussion.

"Vapor-Phase Cooling for Internal-Combustion Engines," was the topic discussed by Mr. Wallace, the first technical speaker. This system, which has been in operation for about two years, makes use of the latent heat of water, explained the speaker. He stated further that with this system it becomes possible to operate an engine satisfactorily at a high temperature, and to automatically maintain this temperature through any range of engine output and ambient temperature.

The speaker described the system in some detail and compared it with other cooling systems in use on automotive and industrial equipment.

Test results have been "gratifying beyond expectations," Mr. Wallace declared in reporting experience with the Vapor-Phase system on 28 engines varying in bore size from 3 to 12 in. He mentioned 21 advantages, which he listed under the headings of thermal, mechanical, and economical.

Mr. Robbins, the second speaker, told how, despite efforts of automotive engineers to make motors quiet, sound motion pictures forced the automotive equipment used by the studios to generate power to move 1200 ft from the camera to avoid microphone pickup. That was in 1928. Since then, he reported, work at Paramount has developed a method of quieting motors so that 144-kw generators, powered by modified 300-hp Model H-3 Wright-Hispano wartime-type engines, can be used 200 ft from the camera; 57-kw generators with Lincoln-Zephyr powerplants, within 150 ft; and Ford-engine-powered 42-kw generators, within 100 ft. Seldom utilized for more than 15 min at a time, these machines are 25, 35, and 60-kw generators operating at 150% overloads.

Prior to these advances in noise reduction, which won an Academy Award, effects of water in motion, ripples, and rain were generally shot without sound recording, which necessitated the "dubbing" of required noises at a later date. This was due to the impracticability of obtaining working pressures from the 1200-ft distances imposed because the noise generated by motors would be picked up by the microphone.

As it was found that normal automotive noise-reduction methods were not adequate, he continued, Paramount's engineering department set out to design a machine that would eliminate the operation difficulties encountered.

A sound-proof case housing the engine, coupling, mufflers, and generator seemed to present the only logical approach, and later was proven to be the correct one, Mr. Robbins stated. However, he continued, there were a few things yet to be overcome, such as the dissipation of parasite heat, proper cooling of exhaust lines, manifolds, and mufflers, maintenance of reasonable limitations as related to weight and size, accessibility for quick repairs or adjustments, and prevention of generator overheating.

Continuing his paper, Mr. Robbins told how these difficulties were overcome and the noise level reduced.

---

*A feature of the meeting was the presentation of a gavel to W. E. Powelson in recognition of his service as chairman of the Section in 1938-1939. Wallace Linville made the presentation on behalf of the Section.*

## Varied Program Offered At Two-Session Meeting

● **Kansas City**

Intimate glimpses into the life of piston rings and facts about diesel engines for track-type tractor service were afternoon topics opening the Kansas City Section's two-session meeting, April 18. After-dinner papers pointed attention to lubrication development in relation to engine design, and the comeback of a hundred-year-old bearing alloy. Both well-attended sessions were presided over by Section Chairman R. J. Collins. E. F. Lowe, SAE assistant general manager, was a guest at the meeting.

Putting the spotlight on "Piston Rings and the Last Inch of Travel at the Top of the Bore," first speaker Theron Bradshaw, Perfect Circle Co., declared: "Few of us attach enough value to the 'opinion' or 'fact' that the top inch of piston travel in the cylinder bore is the most vital part of the engine," and "too few of us consider seriously the effect of piston-ring combinations on this part."

He reminded his listeners that the engine's

one job is to produce power economically, and that all power is produced in the cylinders. Further, he maintained, the last inch of travel at the top of the bore is the most vital part of the engine in that "it accounts for 90% of that thing for which we design and build or rebuild the engine."

Continuing, Mr. Bradshaw stated his contention that "piston rings play an important part in prolonging the life or shortening the life of this important part of the engine," and that "piston rings must be considered as combinations of piston rings to best accomplish our purpose of producing power at the lowest possible cost per mile for the longest possible time between overhaul periods." He elaborated on these points and suggested types and combinations of rings that he considers best protect and take the greatest advantage from "the last inch of travel at the top of the bore."

### Calls Diesel Engine "Winner"

"The diesel engine is the winner in our business – hands down," declared H. H. Howard, sales manager, engine division, Caterpillar Tractor Co., in his presentation, "A Diesel Engine for Track-Type Tractor Service." Gasoline power is not even offered in the larger tractors built by his company, he said, adding that most commercial operators will have nothing but diesel in any size.

Tracing tractor development from the days of the steam wheel-type, he gave special attention to the early application of diesel engines in tractor service. Mr. Howard commented that customers anticipated manufacturers in the application of diesel engines in track-type tractors, fitting marine and other diesels to these units. However, he reported, 10 or 12 years ago there did not exist – so far as his company could discover – a diesel engine which could meet all the requirements for a track-type tractor. He explained how his company set out to develop a diesel engine which would fill the bill, and gave technical details of the one developed.

S. M. McKee, superintendent and lubrication engineer, Nourse Oil Co., in the first paper of the evening session, met the question asked in the title of his paper, "Has Lubrication Kept Pace with Engine Design?" with an affirmative answer, stressing strides being made by lubrication engineers. Summing up, he said: "Comparing engine progress with development of lubricating oils, the former holds the preferred position due largely to the fact that it is a product of a definite science. The latter has been hindered by the fact that there is such a divergence of thought as to what is required with the public sharing the controversy through their continued increasing demand and use of petroleum products.

"However," Mr. McKee added, "recent developments are encouraging due to research which is placing lubricating oils and all other petroleum products on a definite scientific basis. Growing cooperation between lubricating engineers and engine designers means that eventually they will go hand in hand in producing engines which will be more efficient from every angle."

### New Babbitt Bearing Described

"In the maze of all the bearing alloys known, babbitt still remains the ideal bearing material," K. K. Karpinski, engineering department, Chrysler Corp., told his Kansas City listeners in the final paper of the two-session meeting. Although this hundred-year-old alloy suffered a setback with the trend toward obtaining greater output from engines, he continued, babbitt bearings recently staged a comeback in a variety of interesting forms, all based upon the general principle of a thin layer of babbitt.

Such a phenomenal increase in bearing endurance, Mr. Karpinski claimed, could not have been produced by any redesigning of the connecting rod, piston, or piston pin to reduce the reciprocating load on the bearing, as did just the change in the babbitt thickness. The new bearings have shown increases in bearing life of four to five times better than the old thick babbitt bearings, he reported.

Comparing the new with the old, the speaker noted that in the past babbitt thicknesses used were around 0.025 to 0.031 in., while of late 0.010 to 0.018-in. thicknesses have been used on the connecting-rod bearings, and from 0.020 to 0.027-in. babbitt thicknesses on main bearings, applied to various backing materials such as bronze or steel.

Mr. Karpinski devoted the main portion of his paper to discussion of exhaustive tests made in the laboratory and on the road in the development of this type of bearing.

## Society Exhibits at Petroleum Exposition

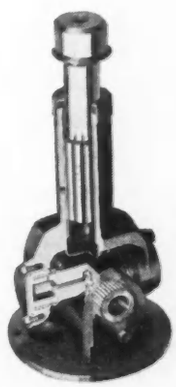
Participating in the International Petroleum Exposition at Tulsa, Okla., May 18-25, the SAE, in its exhibit, stressed the Society's accomplishments in research and standardization, and its cooperation with the petroleum industry.

On display were a Wright aircraft engine with a list of items which conform to SAE Standards, and two CFR engines, loaned by the Waukesha Motor Co. One of these engines was a CFR Aviation-Fuel Knock-Testing Unit, and the other a CFR Diesel-Fuel Testing Unit. The Society's publications and SAE membership data were also given a prominent part in the exhibit.

Arrangements for the display were made by

THE Accepted Spicer UNIVERSAL JOINT

The superiority of Spicer Needle Bearing Universal Joints is accepted among all branches of the automotive industry. This acceptance has resulted from their years of faultless performance as original and replacement equipment on many leading makes of cars, trucks, buses and tractors. The tested and proved advantages of the Spicer Needle Bearing principle in reducing friction, increasing load capacity, providing quiet efficient performance has made it the most desirable universal joint for all automotive equipment. To improve performance and service, insist upon Spicer Needle Bearing Universal Joints.



SPICER Needle-Bearing Universal Joint

SPICER Needle-Bearing Assembly

Spicer Manufacturing Corporation • Toledo, Ohio

BROWN-LIPE CLUTCHES and TRANSMISSIONS
SALISBURY FRONT and REAR AXLES
SPICER UNIVERSAL JOINTS
PARISH FRAMES READING, PA.

William F. Lowe, secretary of the SAE Tulsa Group, and D. E. Hamilton was in charge of the SAE booth during the week of the Exposition, assisted by volunteers from the Group.

## European Aircraft Engines Compared

● **Canadian**

British, French, Italian, and German airplane engines were compared and discussed before 500 members of the Canadian Section, at the annual Windsor dinner meeting, April 19.

J. B. Candlish, F.R.S.A., inventor, designer, diesel engine expert and engineer with the Ford Motor Co. of Canada, Ltd., was the speaker, and he spoke with the authority of an engineer with thirty years experience in airplane engine detail.

"Great Britain and France have engines in their airplanes that are superior in a number of ways to Germany's, but the Germans do have engines you can't laugh off," he told the assembly. Mr. Candlish said that newspapers report that Germany is running short of high antiknock gasoline. "There's no question about that," he declared, "and there's no question but that Germany requires a lot of it." But, the speaker went on to say, that Germany does not require so much high antiknock fuel as the world believes; the high-compression fuel-injection engine is Germany's answer.

"German engineers have been seeking higher and higher compression ratios," he explained. "From a military standpoint that's important. As the Germans view it, they haven't much fuel and they must go out of their own country to wage war. The high-compression-engine powered plane actually gets lighter the more hours it flies. Now it is safe to say 40% of German aircraft engines are powered with compression-ignition engines.

"They are capable of using tallow, lard, peanut oil, cottonseed oil, soy bean oil and other types of heavy fuel if they run short of gasoline. Some of these fuels must be pre-heated."

Highlights of famous British engines powering the fast R. A. F. and R. C. A. F. flying fortresses and lighter, speedy fighter planes were outlined by Mr. Candlish, in the course of a highly technical talk which he illustrated with lantern slides.

Mr. Candlish took occasion to question 400-mph planes, stating: "We read a great deal about 400-mph planes, but I want to tell you something . . . such planes don't grow on bushes. Knowing something about engines and airplanes, I advise you to take these reports with a grain of salt. There are only two countries in the world which have officially broken 400 mph in planes, and these are England and Italy, and it is not every plane that can do it. It takes a remarkable engine to do that."

The speaker was introduced by R. M. Sale, sales manager of Ford Motor Co. of Canada. Marcus L. Brown, Jr., Toronto, chairman of the Canadian Section, was chairman, turning the gavel over to John C. Hickey, of Chrysler Corp. of Canada, Windsor, who is regional vice chairman, and who acted as toastmaster.

Titeflex
REG. U.S. PAT. OFF.

ALL-METAL—FLEXIBLE

TUBING

. . . . .

First choice of leading automotive laboratories for over 20 years for flexible fuel, oil and air lines.

. . . . .

Ideal for plant equipment carrying steam, oil, air, gas, hydraulic oils, refrigerants, grease, etc.

. . . . .

Due to its ability to absorb within its convoluted diaphragm construction movement both mechanical and vibratory, Titeflex can be adapted to all types of machinery and motorized equipment. Send us your specifications.

. . . . .

Titeflex Metal Hose Co.
NEWARK N. J.

## 200 View Fighting Planes At Army Air Corps Base

● **No. California**

The ideal combination of perfect weather and a subject of great current interest resulted in 200 or more members and guests of the Northern California Section motoring some 20 miles out of San Francisco to the United States Army Air Corps base at Hamilton Field for an aviation meeting on May 7. Arrangements were made by W. V. Hanley, Standard Oil Co. of Calif., who is to be the Section's aviation vice-chairman next year. In addition to those who motored to the base, 20 or so elected to arrive by air from various Bay area points in six private ships which landed at Hamilton Field.

A special display of military aircraft and their equipment had been arranged by the Army and for several hours preceding the dinner the visitors displayed a keen interest in the inspection of the equipment and in questioning the Army personnel who were in attendance. The airplanes included the 4-motored Boeing "Flying Fortresses," 2-engined Douglas bombers, Curtiss bombers and pursuit ships. In addition to these there was a display of photographic equipment, machine guns, bombs and other material used by the 7th Bombardment Squadron and the 88th Reconnaissance Squadron now based at Hamilton Field.

Following the afternoon inspection period, the group moved to the officers' club for dinner. Representing the Army as host for the evening was Major Adler, who apologized for having to serve as an extemporaneous host by reason of the enforced absence of Col. J. F. Curry, Commanding Officer at Hamilton Field, and Col. Ralph Royce, who had been scheduled to speak before the group.

Major Adler in a brief talk explained that the responsibility of the field's commanding officer extends far beyond the immediate field itself, since Hamilton Field is headquarters for one of six Army Air Corps areas in the country. The commanding officer, he said, is responsible for the interests of the Air Corps in the entire area which, in the case of Hamilton Field, extends from Canada in the north to Bakersfield in the south, and Salt Lake City in the east. Since aircraft operations in times of emergency would not be confined to the main base itself, it is necessary that the Area Command have full

## SAE *Coming* EVENTS

### June 9-14

Summer Meeting
The Greenbrier –
White Sulphur Springs, W. Va.

●

### Oct. 14

Annual Dinner
Hotel Commodore – New York City

●

### Oct. 31, Nov. 1-2

National Aircraft Production Meeting
*(and Engineering Display)*
Hotel Biltmore – Los Angeles

●

**Buffalo – No Meeting**

**Canadian – June 21**
Toronto, Ont. Annual Outing.

**Chicago – No Meeting**

**Detroit – June 26**
Detroit Yacht Club; dinner-dance.

**Milwaukee – No Meeting**

**Northern California – June 11**
Hotel Bellevue, San Francisco; dinner 6:30 p.m. Subject: Operation and Maintenance – "Open Forum" with S. B. Shaw, vice-chairman of the section in charge.

**Oregon – June 14**

**Southern California – June 14**
Elks Temple, Los Angeles; dinner 6:30 p.m. Subject: Technique Contributing to Safety. Air Traffic Control – Ponton de Arcy, traffic supervisor, Civil Aeronautics Authority; Air Worthiness of Aircraft – H. G. Stormburner, chief engineer, Civil Aeronautics Authority.

**Syracuse – No Meeting**

**Washington – No Meeting**

knowledge of all available facilities within the area, so that military operations in the air, including supporting ground activities, may be carried on from a variety of points.

After outlining the broad purpose of the activities centered at Hamilton Field, which now has a resident personnel of some 2200 officers and men, Major Adler remarked that military aviation development is a continual race between the engine and airplane engineers, each of which is continually calling upon the other for more performance, more power output, and so on.

Speaking of some points which had been brought to the public attention by European hostilities, Major Adler said that while it was formerly felt that heavily armed bombers would not be attacked so closely as to need bullet-proof fuel tanks and protective armor for vital points and crew, it has now been shown that such attacks are taking place regularly and that the aforementioned protective elements must be incorporated in ships involved in actual combat. Likewise, said Major Adler, there is a marked stepping up in the size of the aircraft armament. Whereas in the past 30 and 50 caliber machine guns were used and considered adequate, the current viewpoint calls for guns of 50 caliber and up, including cannon of relatively large bore, and capable of inflicting major damage.

Matters not to be taken lightly, emphasized Major Adler, are ground facilities, such as maintenance shops, fuel supply and distribution, night lighting, and many other non-spectacular but highly essential components of large scale military activities in the air.

Section Chairman U. A. Patchett called upon Past Chairman Howard Baxter to thank Major Adler and the Hamilton Field staff in behalf of the Society.

## Purdue Tops Michigan in Diesel Engine Debate

● **Indiana**

The four-cycle diesel engine offers greater commercial possibilities for the automotive field than does the two-cycle diesel – that was what students from Purdue University "proved" when they won a close decision over University of Michigan representatives in a debate that made the final meeting of the Indiana Section, May 9, one of the season's best. More than 200 Section members and guests were on hand.

The winning team, R. E. Potts and R. O. Duckworth, SAE Student Branch members at Purdue, received a prize of $50. Maxwell Anning and Norman Taylor, the University of Michigan Student Branch team, received $25 expense money. Judges were Frank Jardine, Aluminum Co. of America, chairman; Macy O. Teetor, Perfect Circle Co.; and Charles E. Walters, Butler University.

Purdue alternates were R. A. S. Spracker and L. L. Hunter; for Michigan, Alec Pentland and John Hemmeleff.

Both teams have worked hard on the debate since early in April. The judges' decision was based upon presentation (25 points) and merit of argument (75 points).

## Industrial Applications Of Fluid Drives Reviewed

● **Oregon**

From Racine, Wis., came R. M. Schaefer, manager, hydraulic department, Twin Disc Clutch Co., to address the April meeting of the Oregon Section on the industrial applications of fluid drives. He analyzed the development of the hydraulic-coupling and torque-converter types and gave specific technical information on each, as manufactured by his company.

Both types, he said, have the advantages of smooth starting, absorption of shock loads, absorption of torsional vibrations, and inability to stall the engine.

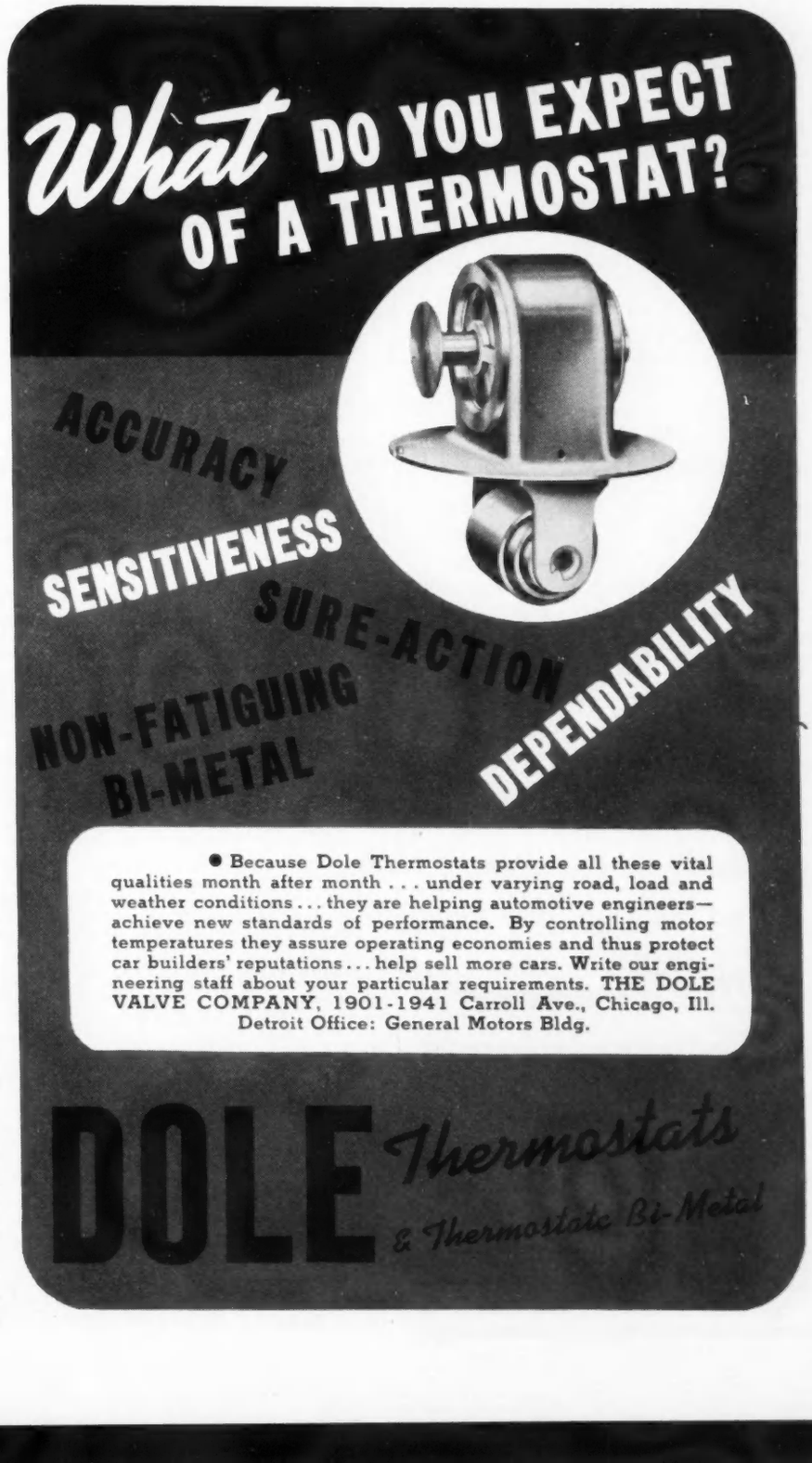
Among the outstanding applications of the units, as cited by Mr. Schaefer, are marine service; synchronization of two motors to a generator; coupling of slush pumps with motors; placement on excavators to provide cushion on lines against shock loads; placement on diesel engines of trains for smooth acceleration and to couple motors in parallel without "fight" between the latter; placement on mining locomotives and cranes; and placement on oil field hoists.

Slides accompanying Mr. Schaefer's technical discussion illustrated the elementary types of fluid drives then carried forward to the two which were the object of the talk. They also included descriptive graphs showing the plotted per cent of torque and slip, drag torque, engine torque and efficiency.

## Air Travel Reported Up 116-Fold in Decade

● **Metropolitan**

Although a number of airlines have shown remarkable progress during the past decade, the Government faces the problem of helping those lines serving less-frequented travel in the interest of aiding the industry as a whole and to strengthen the nation's defense program, J. Parker Van Zandt, economic and technical adviser of the Civil Aeronautics Authority, told


What DO YOU EXPECT OF A THERMOSTAT?
ACCURACY
SENSITIVENESS
SURE-ACTION
NON-FATIGUING BI-METAL
DEPENDABILITY
● Because Dole Thermostats provide all these vital qualities month after month . . . under varying road, load and weather conditions . . . they are helping automotive engineers—achieve new standards of performance. By controlling motor temperatures they assure operating economies and thus protect car builders' reputations . . . help sell more cars. Write our engineering staff about your particular requirements. THE DOLE VALVE COMPANY, 1901-1941 Carroll Ave., Chicago, Ill.
Detroit Office: General Motors Bldg.
DOLE Thermostats & Thermostatic Bi-Metal

Positive-type Ozalid whiteprints consist of dark lines on a white background. They are "contrasty", sharp, and easy to read and write upon. They are easy to check. They increase efficiency and reduce errors.

No liquids touch Ozalid whiteprints. Hence, they do not curl or wrinkle and are true to scale of the original. There is no washing or fixing, no waste of solution or materials and no time lost in waiting for prints to dry. Finished whiteprints emerge from an Ozalid machine dry and ready for use.

*A booklet of dry-developed Ozalid whiteprints and complete information on the Ozalid Process will be sent without cost or obligation. Mail coupon today.*

**ONLY OZALID HAS DRY DEVELOPMENT**

Ozalid CORPORATION
ANSCO ROAD · JOHNSON CITY, N. Y.

OZALID CORP. 46-6
Ansco Road, Johnson City, N. Y.

Please send me free sample booklet of dry-developed Whiteprints and complete information on the Ozalid Process.

Name_____

Company_____

Street_____

City_____ State_____


more than 500 members and guests of Metropolitan Section, April 18.

Last year, he reported, domestic airlines carried 116 times the number of passengers that were carried ten years ago; average cruising speeds have more than doubled during the decade; fares have dropped 50%; and, during the past 12 months, there were no fatalities in airline operation.

Illustrating the rapid development of passenger airplane design with slides, Mr. Van Zandt predicted that more of the smaller lines would buy up-to-date equipment and merchandise air travel as vigorously as do the major systems.

While revenue miles flown have shown an increase of only 50% during the past five years, passenger seat-miles have gained about 100%, revenue passengers have gained nearly 300%, and express and mail tonnage have gained nearly 200%, according to statistics offered by Mr. Van Zandt. These increases were due to airlines using larger and faster airships.

Although the number of planes in service have dropped from 356 in 1935 to 265 in 1939, he reported, average seats per plane have increased from 10.34 to 14.63, and airliners are flying more hours per day than ever before. The average pay-passenger per trip has risen from 5.04 to 8.21 persons during this period.

In 1935 the domestic airlines carried 863 pilots and co-pilots, and personnel employed totaled 5917; in 1939 the carriers employed 1385 pilots and co-pilots and total number of employees rose to 10,509.

Airway mileage gained 8314 miles during the past five years, now having reached 36,581 miles.

"Considering the difficulties overcome to make a perfect safety record for over 800,000,000 passenger-miles flown, the economic problems still to be solved are certainly possible of solution," he said.

Charles Froesch, chief engineer of Eastern Airlines, Inc., pointed out that the fundamental question in making airlines profitable is precisely the same as making a fleet of buses or trucks pay dividends – to keep as much of the equipment carrying payloads as many hours per day as possible.

Ralph S. Damon, vice president of American Airlines, Inc., said that an airship probably has a greater and more rapid variation in value than any other piece of equipment, because it ceases to have any value – in spite of its great cost – as soon as the door is opened and the passengers disembark.

---

*Rudolph F. Gagg, recently elected chairman of Metropolitan Section was introduced, and SAE President Arthur Nutt presented Retiring Chairman T. L. Preble with a scroll commemorating his leadership of the Section during the present season. John A. C. Warner, secretary and general manager of the Society "paid off" Mr. Preble with a framed dollar bill, citing him as an outstanding example of "a dollar-a-year-man" in the service of the Society.*

*Past chairmen of the Section were honored in an historical review presented by F. K. Glynn, and W. E. Conway reported a new high for recent years achieved by his membership committee, with a total of 142 applications received.*

## Pioneer Tells Strides In Automatic Flight

● **Buffalo**

Mortimer F. Bates, who worked for Wilbur and Orville Wright in the early days of aviation, and learned to fly in 1911, gave a comprehensive review of the development of aircraft automatic stabilizers at the April 17 joint meeting of the SAE Buffalo Section and the Aero Club of Buffalo.

Mr. Bates is senior project engineer with the Sperry Gyroscope Co. and has presented his paper on "Automatic Flight" before the Metropolitan and Southern New England Sections of the Society. He described both American and European developments in this field, closing with a complete description of today's models developed by his company, thousands of which are used in transport and government planes here and abroad. The paper, as presented before the Metropolitan Section, is reported on page 30 of the January SAE Journal.

Unexpected visitors were SAE President Arthur Nutt and John A. C. Warner, general manager of the Society, each of whom spoke briefly. Mr. Nutt's visit to the Buffalo Section was like a homecoming as he had lived in that city for a number of years while with the Curtiss Aeroplane & Motor Co., one of the original companies of the present Curtiss-Wright Corp. He has been with the Curtiss-Wright organization for 24 years and now is vice president for engineering of its Wright Aeronautical Corp., Paterson, N. J.

President Marsden of the Aero Club and Buffalo Section and Vice Chairman G. M. Magrum were joint chairmen of the meeting.

## Sums Up Findings on Chrome Plating Bores

● **Philadelphia**

In chromium plating cylinder bores the most elementary demands are that the electrolytic coating must be of perfect adherence to the cast-iron bore; the thickness must be equal, within limits; and there must not be any tiny ridges for the rings to run up against, said Hendrick van der Horst in reporting ten years of research in this field at the Philadelphia Section's April 10 meeting.

Study has shown, he stated, that the ordinary bright, dense coating of chromium is not suitable for cylinder bores inasmuch as it does not hold lubricating oil. This problem has been overcome, he explained, by using a chromium coating of such an open structure that the weight of a certain volume is 30% less than an equal amount of the usual dense chromium coating.

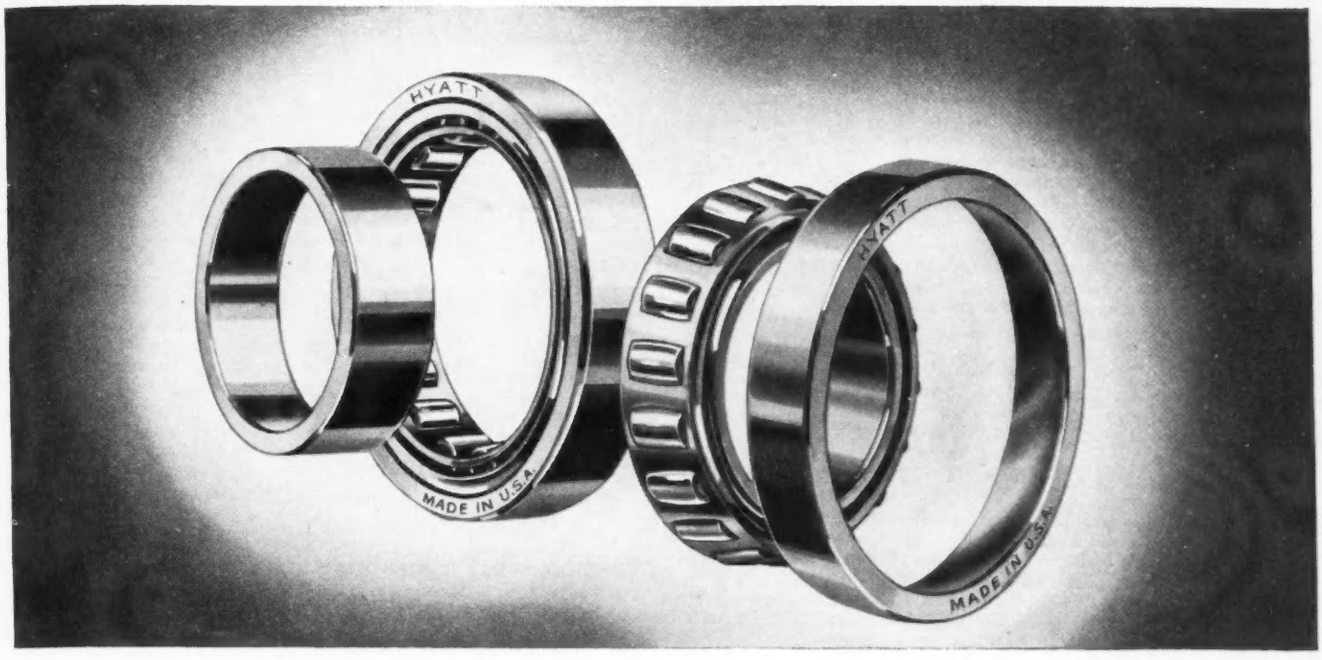
Mr. van der Horst also pointed out that it is one thing to chrome plate a half-dozen blocks, and an entirely different thing to do, say, 100 bores a day. This, he explained, is due to the fact that while plating the chromium solution changes, resulting in quite an electro-chemical problem in quantity production. He added that there are ways and means to overcome this.

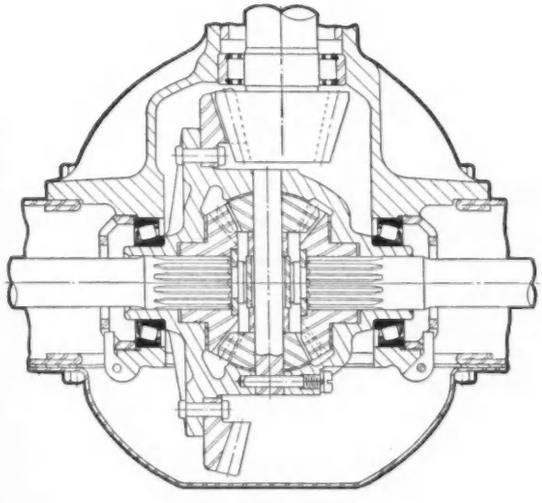
That chromium plating will give an appreciable reduction in bore wear seems to be a cut and dried fact, said Mr. van der Horst, assuring his audience that in the least favorable cases it is four times better as compared to specially prepared materials, such as hardened liners. Common results were cited as one-tenth to one-fortieth of the wear on cast-iron bores.

The author emphasized his sureness that the resistance to wear of chromium is due chiefly to its non-corrosive properties. In the order of their importance, he listed the following as responsible for its non-wearing characteristics: resistance to corrosion; very low surface tension; and hardness.

With regard to the latter, Mr. van der Horst added, "I would feel inclined to say that hardness is of little importance. But then what to say of extensive runs under conditions where engines were known to wear badly presumably because of sand dust? Apply chromium and the results are incredibly favorable. Offhand this seems to point to hardness, or, at any rate, to resistance against abrasive wear. However, some of these well conducted runs were compared to cylinder liners of about 1000 Brinell while the chrome bores were 1150 Brinell. This difference does not seem to warrant the 12 to 1 difference in wear, the worst wear on chrome being 0.002 in. after 5400 hr or, ex-

# FOR Quiet Mileage DIFFERENTIALS



**A Hyatt Combination for Quiet Operation— above at left, Hyatt Hy-Load Pinion Bearing — above at right, Hyatt Spherangular Differential Bearing.**

Hyatt Spherangular differential bearings are designed to take any combination of radial and thrust loads quietly and efficiently. The self-aligning principle assures correct load distribution at all times, benefiting the user by providing long life and freedom from service adjustments. Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J., and Detroit, Mich.

HYATT

ROLLER BEARINGS

QUIET

pressed in terms of the road, about 180,000 miles."

Taking part in the lively discussion that followed presentation of the paper were: A. Ludlow Clayden, Sun Oil Co.; B. B. Bachman, Autocar Co.; Adolf Gelpke, Autocar Co.; J. P. Stewart, Socony-Vacuum Oil Co., Inc.; Emil P. Gohn, Atlantic Refining Co.; Henry Jennings, *Commercial Car Journal*; Cecil M. Billings, Gulf Oil Corp.; Henry L. Brownback, consulting engineer; and Theodore P. Hetzel, instructor of mechanical engineering, Haverford College. Mr. Hetzel was chairman of the meeting.

Discussers raised the question as to whether any study had been made of the possibilities of plating inner parts of the engine other than cylinder bores, such as valve heads, piston heads, cylinder heads and crankcase. Mr. van der Horst stated that work of this sort had been tried and the results obtained were very disappointing. He emphasized that good machine finishes and suitable shapes are prerequisites to satisfactory plating.

To the question "Has anything been done about chromium plating bearings?" the speaker replied that work with bearings has not yet gone beyond the test stage. He added, however, that tests thus far had proved satisfactory.

It was also brought out in discussion that outboard racing engines have used chromium plating of cylinders to great advantage. In this respect Mr. van der Horst hinted that by 1941 all leading American outboard manufacturers will have adopted this practice on sport as well as racing models.

Questioned as to production costs of the process, the speaker ventured an estimate of $5 per block based on a production of 100 to 150 blocks per week for 6-cyl engines with 4-in. bore.

## Driving Habits Shown To Influence Tire Wear

**● Pittsburgh**

Addressing the Pittsburgh Section's April 23 meeting, E. A. Roberts, development engineer, Firestone Tire & Rubber Co., named the driver as the main factor influencing tire wear. Under fairly comparable road conditions, he said, one driver may get 35,000 miles from a set of tires while another, using the same kind of tires, gets only 5000 miles of service.

He brought out that speed is costly, particularly in its effect on tires, when he told Pittsburgh members and guests that front tires give 140% more wear and that rear tires last twice as long at 55 mph than they do at 70 mph.

Extra tire mileage is sacrificed by drivers who take advantage of the fact that modern tires are easier to turn fast around curves, and by those who accelerate too fast, he stated, explaining the effect of tire scrub. To determine tire scrub, he reported, engineers place emery grains on silvered plates and then run tires over them under various conditions of speed and load. Study of the grain movement shows how the tread rubber at the shoulder moves and indicates why wear results, he related.

Evils of overload were depicted by Mr. Roberts, as were steps taken by manufacturers to equalize tire wear between the front and rear wheels. He also explained the effects of tires on car stability, cornering, traction, shimmy, riding comfort, and noise. The best tire design, he stated, is necessarily a compromise.

During the discussion, John M. Orr, Equitable Auto Co., brought out that he has found recapped tires to be from 5 to 64 oz-in. out of balance. Consequently he preferred to have them put on rear wheels. This out-of-balance condition was ascribed to uneven tire growth through use. It was pointed out that new tire assemblies usually are balanced to within 20 oz-in., and that a tire 50 oz-in. or more out of balance may cause hop and chatter of rear wheels while rounding curves.

B. H. Eaton, Bell Telephone Co. of Pa., suggested the advisability of keeping spare tires in a protected place to prevent checking and cracking. In modern tires, it was stated, complex organic compounds have the same effect in preventing the oxidation of rubber as chromium and nickel in preventing the oxidation of stainless steel.

Among the others participating in discussion were: F. W. Heisley, Joseph Woodwell Co.; R. M. Welker, Gulf Oil Corp.; and F. E. Haller, Mt. Lebanon Garage Co.

## Weight Saving Stressed At Aircraft Meeting

**● So. California**

Saving of weight received prime consideration at the special aircraft materials meeting of the Southern California Section, held at San Diego, April 19. More than 300 members and guests attended, many of them connected with the Army and Navy Air Bases, and aircraft companies with plants in the San Diego area. A large number journeyed from Los Angeles and nearby cities.

Taking "Plastics in Aircraft" as his subject, Walter Hite, chief engineer, Timm Aircraft Co., opened the program which he shared with K. R. Jackman, chief of structural tests, Consolidated Aircraft Co. Earl D. Prudden, vice president, Ryan Aeronautical Co., was toastmaster.

"In no other branch of engineering does the penalty for heavy structures or inefficient design bring such immediate consequences," said Mr. Jackman in introducing his paper, "Modern Aircraft Materials and Their Testing." It is the realization that every pound of weight saved in the initial design of the airplane will mean an extra pound of payload, that keeps engineers on the lookout for lighter structures, he added.

"From a quick glance at some of the newer aircraft materials and test procedures," Mr. Jackman stated, "we find that the high tensile aluminum alloys still hold the structural field, although crowded a little by some of the magnesium alloys. The alloys of beryllium hold only minor structural promise but the pure beryllium metal may have a future for armor plate in planes. Chrome-molybdenum steel maintains its favored position, but it has lost some ground to the stainless steels, especially of the heat-treatable 'M-286' variety.

"Plastic and wood-and-plastic construction," he opined, "probably will not immediately replace light metal construction. Thermoplastic windows, with their weight savings, are edging out those of laminated glass, but should be carefully tested for pressurized cabin use.

"The prestretching of aluminum-alloy stiffeners offers a method of gaining strength at no cost in weight or price," he stated, also noting that precompressing, theoretically of great promise, runs into practical shop difficulties on application.

On the subject of testing, Mr. Jackman said, "the electric-resistance strain gage of the 'Celstrain' or 'Baldwin-Southwark' type promises to add new impetus to practical full-scale testing and research, and at one-tenth of the instrumentation cost of former remote recording extensometers."

Others participating in the program included: J. C. Lyon, West Coast representative, E. G. Budd Mfg. Co., who gave a 5-min review of the paper, "Stainless Steel in Aircraft," prepared by Michael Watter of the same company; Coffee Speaker Edwin A. Ross, San Diego State College; and Brint Edwards, Southern California Section's vice chairman for aircraft engineering. Mr. Watter's paper was distributed at the meeting.

## Winning Debaters Favor Fleet-Shop Maintenance

**● New England**

"Should Fleet Operators Do Their Own Maintenance Work?" That was the topic of a six-man debate which stimulated considerable interest at the New England Section's May 14 meeting, the final technical session of the year. F. K. Glynn, American Telephone & Telegraph Co., New York, presided.

On the affirmative side were W. M. Clark, H. B. Church, and Charles Morehouse, who based their arguments on cost experience, which showed to the advantage of fleet-operated shops.

Robert Gardner, Glenn Witham, and Joseph E. Noon, likewise based their discussion on cost data, which favored sending work to dealer service stations. They argued that dealer shops often have more adequate equipment, and that the work is done by men trained under factory supervision.

Dean A. Fales, Charles E. Batstone, and Joseph Postal were the judges. While they were out considering the decision, a show of hands indicated that 28 of those attending believed that the fleets should do their own maintenance work, and that 20 were in favor of sending it to dealer shops. The judges' decision was in agreement with the majority.

## Students Pilgrimage to Indianapolis Speedway

**● M. I. T.**

SAE Student Branch activities at the Massachusetts Institute of Technology have been in high during April and May, climaxing over the Memorial Day week-end with twelve members scheduling a trip to Indianapolis for the 500-mile race.

On April 9, the group was host to 300 at a showing of auto racing films. Four days later a dozen members visited the Museum of Transportation at Princeton, Mass.

The SAE-sponsored exhibit at the M.I.T. Open House, April 27, was an outstanding display of cut-away chassis and motors. Members of the Branch gave lectures describing the general improvements of the 1940 cars.

At the Branch's annual banquet, held May 3, Dean A. Fales, M.I.T. associate professor of automotive engineering, was guest of honor and speaker of the evening. Officers elected for the coming year are: B. W. Holmes, *chairman;* C. A. Kalman, *vice chairman;* F. D. Roe, *secretary-treasurer.*

## Dinner-Dance Ends Season's Activities

**● Milwaukee**

The annual Ladies' Night of the Milwaukee Section was held at the Wisconsin Club, May 3, with approximately 150 in attendance. Not only Milwaukee, but the cities of Waukesha, Madison, Racine, Kenosha, and Beloit, were well represented.

After the dinner there was a half hour of entertainment, followed by dancing.

## Foundation Sponsors $200,000 Award Program

SAE members are eligible to participate in the $200,000 industrial progress award program being sponsored by the James F. Lincoln Arc Welding Foundation. Participants in the program may submit studies which cover any or all social, scientific, economic, and commercial benefits which attest progress in industrial development which can be attributed to application of the electric-arc process of welding, within the 2½ year period, Jan. 1, 1940, to June 1, 1942. There will be 458 awards.

Studies encouraged with a view to creating large-scale benefits, will concern design, manufacture, construction and maintenance of machines, products and structures of all types including: automobiles, trucks, buses, airplanes, locomotives, freight and passenger cars, street cars, ships and boats, buildings, bridges, houses, furniture, heating and air-conditioning equipment, electric refrigerators, farming machinery, and road-building equipment, as well as industrial machines and products of every conceivable kind.

Several SAE members received awards in an earlier contest sponsored by the Foundation. Further information regarding this program may be obtained by writing to the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

## Lubrication Topic of Student Branch Meeting

**• Oregon State**

The importance of correct lubrication was impressed upon members and guests of the SAE Student Branch at Oregon State College on April 11, by a Socony-Vacuum motion picture presented and explained by J. A. McGowan, General Petroleum Corp. of Calif. The picture showed animated oil wedges for the different kinds of bearings and gears, and stressed the necessity of using the correct lubricant for each of the different applications.

In a short talk, Mr. McGowan revealed that heretofore his company had employed graduates only from the eastern states, but that starting this year it will employ men graduating from the colleges of the eleven western states.

More than eighty members and guests of the Student Branch attended the meeting.

## *Engineering Societies Library Offers Service*

The Engineering Societies Library, located at 29 West 39th Street, New York (in the same building with SAE headquarters), has invited all engineers to make use of its new microfilm copying service as well as its photostat service. Both of these services are rendered at cost—making available to engineers, libraries, and companies throughout the world copies of material contained in its 160,000 volumes and the thousands of periodicals in its collection.

The Library will fill orders for 11X14-in. white-on-black photostats at 30¢ each, and black-on-white prints for 30¢ additional. Microfilm copies in 35-mm film are available at a cost of 4¢ per exposure, usually one page, with a minimum charge of $1.25 per volume. These charges include ordinary postage to any part of the world.

For those wishing to photograph any material in the Library, a photographic copying stand, complete with tables and electric lights, is available for use with the visitor's own camera.

Inquiries should be addressed to: Harrison W. Carver, director, Engineering Societies Library, at the above address.

## About Authors

(*Concluded from page 9*)

*Service Mechanical Training Schools at Wilbur Wright Field and St. Paul. He was electrical engineer for the Chrysler Division of Willys Corp., from 1920 to 1923, and was then named to that post with Chrysler Corp. He advanced to chief electrical engineer at the time of the consolidation with Dodge Bros.*

**• Frank H. Riddle** *is a past president of the American Ceramic Society and has been engaged in ceramic research since 1902. Before taking the post as director of research, ceramic division, Champion Spark Plug Co., in 1919, he had spent three years with the National Bureau of Standards, Clay Products Division. There he worked on refractories for the manufacture of optical glass, and devoted considerable time to the development of improved ceramic insulators for spark plugs and other ceramic products. Mr. Riddle received his professional degree as Ceramic Engineer from Ohio State University.*

**• R. F. Gagg** *(M '37), recently elected chairman of the Metropolitan Section for 1940-1941, has been active in technical work related to the testing of both air and liquid-cooled aeronautical engines, and recently has been intimately concerned with the manufacturing problems in this field. Mr. Gagg received his B.S. from the University of Colorado in 1923, and his M.E. from Yale two years later. He joined the Climax Engineering Co. as assistant diesel engineer, and in 1927 was made assistant chief engineer. Leaving Climax in 1930, he became experimental engineer for the Wright Aeronautical Corp., and since 1934 has been assistant chief engineer. Mr. Gagg has been active in Society and Section committee work for several years and has presented a number of papers before SAE meetings.*

AVIATION TYPE
HIGH PERFORMANCE
SELF EMULSIFYING DEGREASING SOLVENT

Brush or spray Gunk on fuselage motor block, truck chassis or garage floor until oil and dirt is "wetted out." Rinse by sluicing with a water hose.

CLEANS USED CARS TOO!

Make your own carburetor and fuel pump cold tank, cleaning solvent from GUNK P-96 CONCENTRATE. So good we simply have to offer GUNK users a Free Formula Bulletin. Cost of a special bath as low as 30c a gallon.

P-96 Gunk — Outside Engine and chassis wash

M-F Gunk (MOTOR FIZIK) — Inside Engine wash and lubricant

X-11 Gunk — Cold Tank Parts Degreaser

Send for "Safety" specification sheet, literature and name of nearest jobber.

The CURRAN CORP. MALDEN — HEADQUARTERS for SELF EMULSIFYING DEGREASING SOLVENT — MFG. CHEMISTS MASS.

COLD
SPRAY - GRANODIZING
for
Sheet-Steel Products

Outstanding protection—perfect uniformity of coating—a smoothness of surface that helps to produce lustrous finishes—low cost, all these are established factors in this unique advance in the art of phosphate coating.

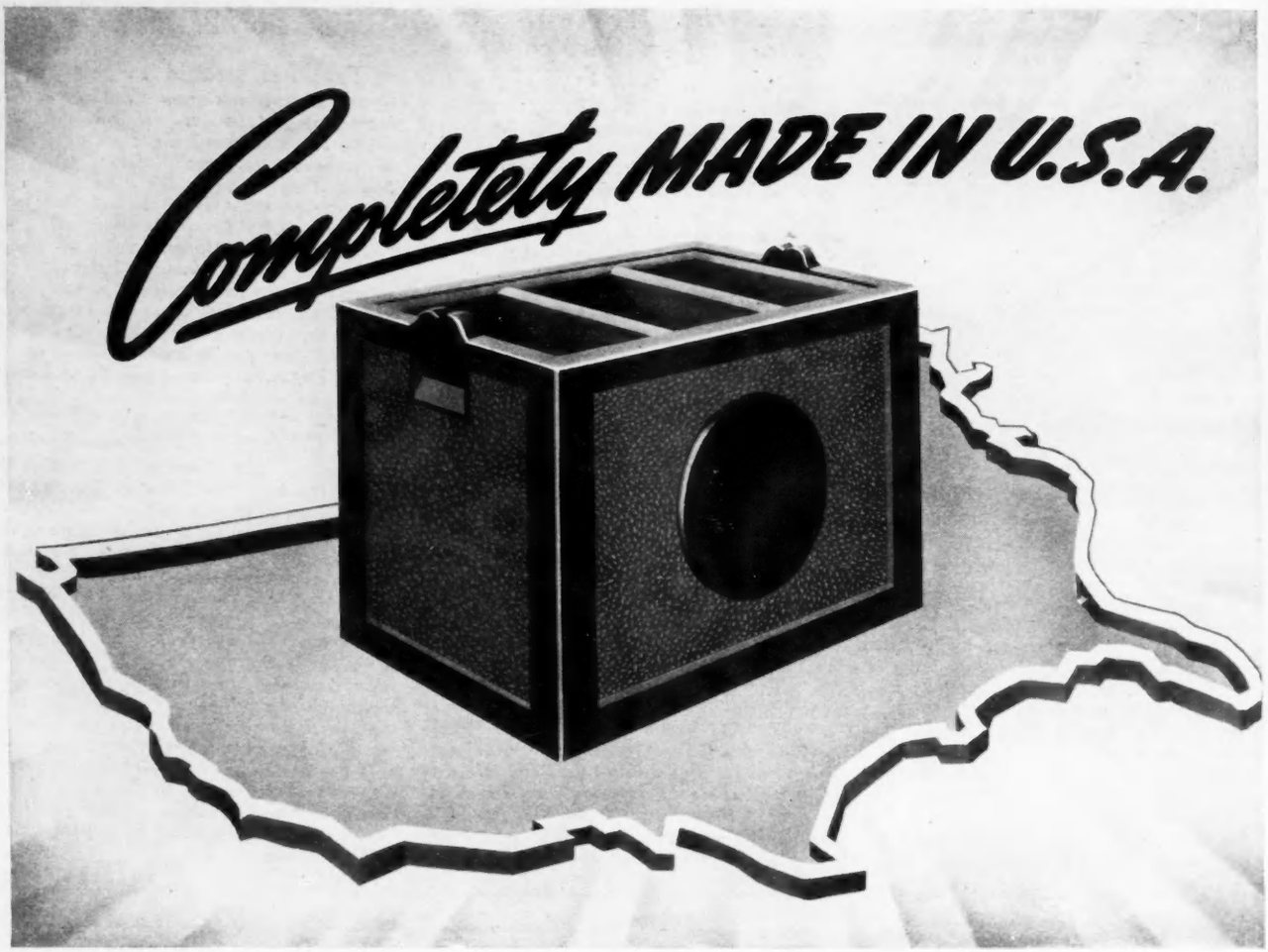
And these factors are all objectives of manufacturers of automobile bodies, fenders and other sheet-metal parts.

Our technicians will gladly discuss the process with you.

AMERICAN CHEMICAL PAINT CO.
Department 305
AMBLER, PENNA.

6339 Palmer Ave., E.
Detroit, Mich.

Canadian Branch
Walkerville, Ont.




# EBROK by RICHARDSON

USERS of EBROK have this assurance: Our own United States provides *all* the raw materials that go into the manufacture of EBROK . . . Richardson is not dependent upon foreign sources of supply with their attendant uncertainty and risk. Thus by using EBROK, continuity of your own production schedules is safeguarded against interruption; quality and prestige are maintained.

"Completely Made in U. S. A." has prideful significance, more potent, more powerful, more satisfying than ever before.

**EBROK CONTAINERS**

The RICHARDSON COMPANY

MELROSE PARK, CHICAGO, ILL. FOUNDED 1858 LOCKLAND, CINCINNATI, OHIO
NEW BRUNSWICK, N. J. INDIANAPOLIS, IND
DETROIT OFFICE: 4-252 G. M. BUILDING, PHONE MADISON 9386
NEW YORK OFFICE: 75 WEST STREET, PHONE WHITEHALL 4-4487